
اللهم أنر قبر منْ حنّ لهُ القلب
اللهم هب له سعة في قبره لا يرا لها نهاية
هب لمضجعه طيبا وَ لظلمته نورا
ولذنوبه غفراناً وَ برّد قبره
وزده احساناً فوق احسانه
واجعل الجنة مسكنه

An 88-year-old man is taken to the Emergency Department by his daughter as he had been feeling unwell that day with chest pains. An ECG reveals that he is suffering an inferior myocardial infarction. He has a heart rate of 33 beats per minute and a blood pressure of 90/60 mmHg. He is given 600 mcg of atropine, to no effect; this is repeated up to 3 mg. Your local hospital does not have an out-of-hours PCI service and you commence an infusion of TPA, but his rate is not immediately improving.

Which of the following treatments would be most suitable to use for his arrhythmia?

A	Adrenaline
B	Glucagon
C	Temporary pacing
D	Isoprenaline
E	Implantation of a permanent pacemaker

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Which of the following treatments would be most suitable to use for his arrhythmia?

Your answer was correct

A	Adrenaline
B	Glucagon
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Explanation

C Temporary pacing

This patient has had an inferior myocardial infarction. The 'inferior' territory is supplied by the right coronary artery, which also supplies the sino-atrial and atrioventricular nodes. As such, inferior myocardial infarction commonly results in conduction deficits and heart block. Heart block and bradycardia are often temporary and can resolve with prompt treatment for the myocardial infarction. Temporary pacing is the correct option, as it will allow appropriate control of heart rate once inserted without precipitating further ischaemia.

A Adrenaline

Adrenaline acts as a non-selective adrenoceptor agonist. Administration would increase the patient's heart rate. However, it will also increase myocardial oxygen requirements due to the positive inotropic effect. As such, adrenalin may worsen myocardial ischemia in this case.

B Glucagon

Glucagon is used in cases of β-blocker overdose. Glucagon activates adenyl cyclase and is theoretically able to exert a chronotropic effect not dependent on the adrenergic pathway. However, the evidence for effectiveness even in β-blocker overdose is limited.

D Isoprenaline

Isoprenaline acts as a β_1-agonist and has a positive chronotropic effect. It is often utilised in patients with complete heart block or bradycardia as a bridging therapy to allow time for a pacing system to be implanted. However, it should not be used in patients with a myocardial infarction as it can worsen ongoing myocardial ischaemia.

E Implantation of a permanent pacemaker

While pacing is required temporarily, conduction deficits due to inferior myocardial infarctions often resolve. As such, implantation of a permanent system is unnecessary at this time.

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Difficulty: Easy

Peer Responses %

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Responses Correct:	1
Responses Incorrect:	0
Responses Total:	1
Responses - % Correct:	100%

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A 32-year-old physiotherapist presents with a 2-week history of increasing shortness of breath and leg swelling. Previously well, she gave birth 8 weeks ago by planned Caesarean section and is breast-feeding. Over the last 4 weeks she became progressively breathless, and developed a dry cough and swollen ankles. She smoked in her teenage years. On examination, she is afebrile with a pulse of 108 bpm and irregular. Her blood pressure is 85/53 mmHg and her respirations at rest are 16 breaths/min, which increased to 24 on light exercise. Jugular venous pressure is elevated at 5 cm and she has pitting oedema of both lower limbs to mid-shin. A pan-systolic murmur, loudest at the apex, and a third heart sound can be heard. Percussion note is dull at the right base and is associated with decreased air entry. Coarse crackles are present at the left base. Her liver is mildly tender and enlarged 3 cm below the right costal margin. Chest X-ray shows a pleural effusion at the right base, a blunted left costophrenic angle, alveolar shadowing at both bases and large pulmonary vessels. Atrial fibrillation with an occasional ectopic beat is evident on ECG.

Investigations:

Hb	112 g/l
WCC	12.5 × 10^9/l
PLT	246 × 10^9/l
Na^+	132 mmol/l
K^+	3.8 mmol/l
Creatinine	84 mol/l
Urea	4.5 mmol/l
Bilirubin	20 μ mol/l
Albumin	36 g/l
ALT	106 U/l
ALP	121 U/l
CRP	34 mg/l
TSH	1.23 mU/l
Free T_4	18.2 nmol/l
MCV	84.3 fl

What is the most likely diagnosis?

A	Atypical pneumonia
B	Pulmonary embolus
C	Peripartum cardiomyopathy
D	Subacute bacterial endocarditis
E	Primary pulmonary hypertension

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B Pulmonary embolus

C Peripartum cardiomyopathy

D Subacute bacterial endocarditis

E Primary pulmonary hypertension

Explanation

C Peripartum cardiomyopathy

Peripartum cardiomyopathy is an idiopathic condition occurring in the last month of pregnancy or in the first five months postpartum. It presents with heart failure secondary to left ventricular systolic dysfunction. The clinical vignette describes a patient with significant heart failure, and this is the most likely underlying diagnosis. Heart failure should be managed with β-blockade and diuretics, and ACE inhibitors can be considered postpartum. In many cases cardiac function recovers, but if it remains poor then heart transplant should be considered.

A Atypical pneumonia

The chest findings reported here could be confused with an atypical pneumonia, but the bilateral nature and the systemic features in keeping with heart failure make this less likely.

B Pulmonary embolus

The risk of pulmonary embolism increases in pregnancy and should be considered in peripartum individuals with dyspnoea. A large pulmonary embolism would lead to features of right-sided heart failure, including a raised JVP and peripheral oedema. However, typically with a pulmonary embolism there would be limited chest findings.

D Subacute bacterial endocarditis

This diagnosis should be considered in all patients with a new pan-systolic murmur. However, there are no additional features to suggest this diagnosis. The pan-systolic murmur present here is likely caused by mitral regurgitation secondary to left ventricular dilatation rather than endocarditis. However, in both cases an echocardiogram would be the next investigative option.

E Primary pulmonary hypertension

This condition normally presents over a longer time-frame than indicated in this case. Furthermore, the primary features are of dyspnoea with right-sided heart failure signs and symptoms developing. Examination of the chest is usually normal, as left ventricular function is often preserved.

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Difficulty: Easy

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Responses Correct:	2
Responses Incorrect:	0
Responses Total:	2
Responses - % Correct:	100%

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A 60-year-old man on long-term haemodialysis presents with chest pain and a troponin of 1.2 (<0.1 μg/l). He is due to dialyse next the following morning. There is T-wave inversion in the lateral leads which was not present on a 12-lead ECG from 2 months earlier. He does not have pulmonary oedema. The pain is only partially relieved by a small dose of IV diamorphine.

Which would be the most appropriate acute cardiovascular management for this man?

A	Aspirin and iv nitrates
B	Aspirin, iv nitrates and abciximab
C	Clopidogrel, aspirin, iv nitrates, iv furosemide and sc LMW heparin 1 mg/kg bd
D	Clopidogrel, aspirin, iv nitrates and fondaparinux
E	Reassure that patient that the raised troponin level is due to his renal failure

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A 60-year-old man on long-term haemodialysis presents with chest pain and a troponin of 1.2 (<0.1 μg/l). He is due to dialyse next the following morning. There is T-wave inversion in the lateral leads which was not present on a 12-lead ECG from 2 months earlier. He does not have pulmonary oedema. The pain is only partially relieved by a small dose of IV diamorphine.

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Your answer was incorrect

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D	Clopidogrel, aspirin, iv nitrates and fondaparinux
E	Reassure that patient that the raised troponin level is due to his renal failure

Explanation

This man is on long-term haemodialysis, and his new ECG changes raise the possibility of an NSTEMI. The longer patients are on dialysis the less likely they will be passing urine. Furosemide would not off-load the patient unless he was passing urine. In any respect, he is not in failure. Nitrates are useful for pain in this case but do not impact on overall prognosis. NICE guidelines with respect to the management of acute coronary syndromes have included use of fondaparinux as opposed to heparin. Whilst fondaparinux accumulates in patients with moderate to severe renal impairment, it is eliminated by dialysis, as such it would be a possible choice here. Abciximab is contraindicated in patients receiving dialysis due to limited availability of clinical data.

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Difficulty: Easy

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Responses Correct:	2
Responses Incorrect:	1
Responses Total:	3
Responses - % Correct:	67%

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A 64-year-old lifelong smoker with known COPD is scheduled to have a bronchoscopy to investigate his weight loss, haemoptysis and dry cough. He is found to be in atrial flutter, 150 bpm, with a blood pressure of only 110 mmHg systolic. He has no history of palpitations.

Which is the best management option?

A	Metoprolol
B	Verapamil
C	Amiodarone
D	Flecainide
E	Cancel the procedure and rebook when the patient is stabilised

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Which is the best management option?

Your answer was incorrect

A	Metoprolol
B	Verapamil
C	Amiodarone
D	Flecainide
E	Cancel the procedure and rebook when the patient is stabilised

Explanation

This is an elective procedure and should therefore be cancelled and rebooked once the patient is stable. As to the management of atrial flutter, the choice is between rate control and rhythm control. If the onset of flutter is unknown it would be safer to rate control rather than try and establish sinus rhythm as there is a risk of thromboembolism. Digoxin is safe and effective for rate control, as are calcium antagonists and b-blockers. b-Blockers are contraindicated in patients with asthma and chronic obstructive pulmonary disease (COPD).

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Difficulty: Average

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Responses Correct:	2
Responses Incorrect:	2
Responses Total:	4
Responses - % Correct:	50%

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A 78-year-old man has just driven his wife to the hospital for a blood test when he suddenly collapses to the ground. There was no chest pain. On questioning, he gives a history of previous collapses in the last 5 years with no predisposing factors. He is on no medication. An ECG performed in A&E shows RBBB (right bundle branch block) with left posterior fascicular block. The PR interval is 205 ms. You are asked to see him.

What is the best management plan?

A	Monitor overnight and then discharge from follow up if this is unremarkable
B	Monitor overnight and then arrange elective permanent pacemaker (PPM) and not drive until then
C	If his blood sugar is normal, reassure and discharge home
D	Treat as NSTEMI
E	Refer to the neurologists

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A 78-year-old man has just driven his wife to the hospital for a blood test when he suddenly collapses to the ground. There was no chest pain. On questioning, he gives a history of previous collapses in the last 5 years with no predisposing factors. He is on no medication. An ECG performed in A&E shows RBBB (right bundle branch block) with left posterior fascicular block. The PR interval is 205 ms. You are asked to see him.

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Explanation

Given his ECG is suggestive of possible episodes of complete heart block because of the RBBB and left posterior fascicular block, and prolonged PR interval, it is likely that his episode of collapse represents a period of complete heart block. He could therefore be listed for permanent pacemaker and told not to drive until the procedure is done.

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Responses Correct:	3
Responses Incorrect:	2
Responses Total:	5
Responses - % Correct:	60%

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A 55-year-old accountant with a history of hypertension and duodenal ulceration presents with tearing interscapular back pain and a new early diastolic murmur. Aortic dissection involving the aortic root disrupting the aortic valve is confirmed on CT scan. The patient undergoes urgent operative intervention with replacement of the aortic root with a Dacron graft and replacement of the valve with a carbomedics prosthesis. After excellent postoperative recovery the patient returns for a follow-up appointment complaining of increasing lethargy, exertional dyspnoea and palpitations. His medication includes warfarin, methyldopa, nifedipine and ranitidine. Physical examination reveals a small haematoma related to his sternal scar, sinus tachycardia, an ejection systolic murmur and pale mucous membranes.

Investigations showed:

WCC	12 x 10^9/l
Hb	5.7 g/dl
MCV	69 fl
Plts	486 x 10^9/l
ESR	27 mm/h
INR	3.7
Direct Coombs test	-ve
Faecal occult blood	-ve
Serum transferrin-receptor assay	Increased
Fibrin degradation products	Increased

What is the most likely diagnosis?

A	Peptic ulceration
B	Autoimmune haemolysis
C	Over-anticoagulation
D	Prosthetic valve dysfunction
E	Valve haemolysis

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Normal Values

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A	Peptic ulceration
B	Autoimmune haemolysis
C	Over-anticoagulation
D	Prosthetic valve dysfunction
E	Valve haemolysis

Explanation

Fragmentation of erythrocytes on a prosthetic valve is an unusual complication of valve replacement but doesn't necessarily imply haemodynamic dysfunction of the valve. It tends to manifest as low-grade iron deficiency anaemia but occasionally causes a clinically important anaemia. A negative faecal occult blood test makes A and C less likely. A negative Coombs test excludes autoimmune haemolysis related to methyldopa treatment. The increased fibrin degradation products also fit with the possibility of valve haemolysis.

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Difficulty: Easy

Peer Responses %

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Responses Correct:	4
Responses Incorrect:	2
Responses Total:	6
Responses - % Correct:	67%

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You are the SHO in the cardiology clinic and wish to start Mr D, who has recently been diagnosed with hypertension, on an agent in addition to his ACE inhibitor. He is a type-2 diabetic who is currently diet-controlled. His BP is 155/90 mmHg.

Which of the following is the most appropriate next agent?

A	Diltiazem
B	Valsartan
C	Atenolol
D	Amlodipine
E	Indapamide

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Normal Values

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Explanation

Beta-blockers and thiazides are not recommended as first or second line agents due to data around their adverse event profile with respect to the impact they have on blood glucose control. As such amlodipine is the next logical choice as diltiazem is cardioselective and may precipitate bradycardia. Valsartan is combined with ACE inhibition in the management of symptomatic heart failure, it may cause hyperkalaemia in combination with ACE inhibition, as such it's not the optimal second line agent here.

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Responses Correct:	5
Responses Incorrect:	2
Responses Total:	7
Responses - % Correct:	71%

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A 78-year-old woman has been admitted four times this year with pulmonary oedema. She has an ejection systolic murmur (ESM) on examination with a slow rising pulse. She is breathless at minimal exertion. She underwent CABG 20 years ago. A recent angiogram revealed 50% stenosis in the circumflex, the right coronary artery is occluded but the graft to the RCA is patent. An echocardiogram shows good LV function with aortic valve area (AVA) 0.42 cm^2 and a gradient across the valve of 72 mmHg (normal < 20 mmHg).

What is the best management option for this patient?

A	Further grafting of her coronaries arteries
B	Stenting of her RCA
C	Stenting of her circumflex as she has severe disease
D	Treatment of her pulmonary oedema, and optimisation of her medication and a review in 3 months
E	Referral for aortic valve replacement

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D	Treatment of her pulmonary oedema, and optimisation of her medication and a review in 3 months
E	Referral for aortic valve replacement

Explanation

This woman has symptomatic severe aortic stenosis (AS). The risks of both conservative and surgical management are high. With such severe AS, the risk associated with conservative management approaches 40–50% combined with a poor quality of life, and hence on balance, the surgical option of aortic valve replacement represents the best option. A redo thoracotomy with valve replacement carries a risk of up to 10%. The surgeon will decide whether to graft the circumflex at the time of surgery. It is the appearance of symptoms which is most closely associated with mortality in AS, such that it is this which drives surgical intervention rather than valve gradient alone.

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Difficulty: Easy

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Responses Correct:	6
Responses Incorrect:	2
Responses Total:	8
Responses - % Correct:	75%

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Which one of the following is a risk factor for *torsade de pointes*?

A	Hyperkalaemia
B	Mild alkalosis
C	Hyponatraemia
D	Hypercalcaemia
E	Female sex

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Which one of the following is a risk factor for *torsade de pointes*?

Your answer was correct

A	Hyperkalaemia
B	Mild alkalosis
C	Hyponatraemia
D	Hypercalcaemia
E	Female sex

Explanation

Other risk factors include: bradycardia, hypokalaemia, congestive heart failure, digitalis therapy, subclinical long-QT syndrome, baseline QT prolongation, severe hypomagnesaemia, severe alkalosis and recent conversion from atrial fibrillation. Female sex is a powerful predictor of the risk of *torsade de pointes* in patients with congenital and acquired long-QT syndromes. How or whether variability in the expression of genes that determine normal cardiac electrophysiology explain the sex-dependent risk of *torsade de pointes* is not yet clear.

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Responses Correct:	7
Responses Incorrect:	2
Responses Total:	9
Responses - % Correct:	78%

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An 80-year-old, known hypertensive is admitted to hospital with congestive heart failure. Physical examination reveals a blood pressure of 175/95 mmHg, a raised JVP, peripheral oedema and bilateral pulmonary crepitations. A chest X-ray shows pulmonary oedema and slight cardiomegaly. Echocardiography results reveal a normal left ventricular cavity, left atrial enlargement and a left ventricular ejection fraction of 65%. The left ventricular Doppler filling pattern is abnormal and a diagnosis of diastolic heart failure is made.

What is the most appropriate step in the initial management of this patient?

A	He should be started on diuretics
B	He will need cardiac catheterisation
C	Digitalis should be started
D	Intravenous fluids should be given
E	Insertion of a central venous line

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Normal Values

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An 80-year-old, known hypertensive is admitted to hospital with congestive heart failure. Physical examination reveals a blood pressure of 175/95 mmHg, a raised JVP, peripheral oedema and bilateral pulmonary crepitations. A chest X-ray shows pulmonary oedema and slight cardiomegaly. Echocardiography results reveal a normal left ventricular cavity, left atrial enlargement and a left ventricular ejection fraction of 65%. The left ventricular Doppler filling pattern is abnormal and a diagnosis of diastolic heart failure is made.

What is the most appropriate step in the initial management of this patient?

Your answer was incorrect

A	He should be started on diuretics
B	He will need cardiac catheterisation
C	Digitalis should be started
D	Intravenous fluids should be given
E	Insertion of a central venous line

Explanation

Cross-section and population-based studies indicate that at least one-third of all patients with congestive heart failure (CHF) have a normal or near–normal ejection fraction. The mortality rate among patients with diastolic heart failure (5–8%) is lower than patients with systolic heart failure (10–15%). There is little published data concerning the incidence of heart failure among patients with diastolic dysfunction as demonstrated by Doppler echocardiography. Echocardiography plays a critical diagnostic role in patients with heart failure, in part because the physical examination, ECG and chest X-ray do not provide information that distinguishes diastolic from systolic heart failure.

Major objectives in management are: to reverse the consequences of diastolic dysfunction and to eliminate or reduce the factors responsible for the diastolic dysfunction. Initial treatment is aimed at reducing pulmonary venous pressure and congestion, and such treatment usually requires therapy with diuretics. Certain angiotensin receptor blockers like losartan, and telmisartan, irbesartan and candesartan possess additional properties, which are independent of ACE inhibition. These include antiplatelet aggregating, hypouricemic, antidiabetic and atrial antifibrillatory effects, which may have a particularly benefical role in this clinical setting. A growing body of evidence shows that angiotensin receptor blockers are an important contribution to the pharmaceutical management of patients with heart failure. Candesartan has a moderate impact in preventing admissions for CHF among patients who have heart failure and a left ventricular ejection fraction (LVEF) higher than 40% (as shown in the CHARM study; see also review referenced below).

A review of the current evidence for the use of angiotensin-receptor blockers in chronic heart failure. Erhardt LR. Int J Clin Pract. 2005 May;59(5):571-8.

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Responses Correct:	7
Responses Incorrect:	3
Responses Total:	10
Responses - % Correct:	70%

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A 55-year-old man had an inferolateral myocardial infarction a year ago. Since then he had been fine and was discharged from your care until a month ago when he started suffering from chest pains again. The chest pains continued to worsen despite increasing his anti-angina medication. Last week he had a coronary angioplasty with stenting of his right coronary artery. He has come to see you in the cardiology clinic complaining of some moderate chest pain on exertion.

Which one of the following medications has been shown conclusively to improve mortality post-myocardial infarction?

A	Calcium antagonists
B	Flecainide
C	Nitrates
D	Clopidogrel
E	Nicorandil

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A 55-year-old man had an inferolateral myocardial infarction a year ago. Since then he had been fine and was discharged from your care until a month ago when he started suffering from chest pains again. The chest pains continued to worsen despite increasing his anti-angina medication. Last week he had a coronary angioplasty with stenting of his right coronary artery. He has come to see you in the cardiology clinic complaining of some moderate chest pain on exertion.

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C	Nitrates
D	Clopidogrel
E	Nicorandil

Explanation

The Second International Study of Infarct Survival (ISIS-2) showed that aspirin and streptokinase, or both, improved survival outcomes in patients with myocardial infarction. The First International Study of Infarct Survival (ISIS-1) revealed an improved survival in a randomised trial of intravenous atenolol among 16,027 cases of suspected acute myocardial infarction. The CAPRIE trial was a randomised, blinded trial of clopidogrel versus aspirin in patients at risk of ischaemic events, it demonstrated and 8.7% relative risk reduction with respect to ischaemic events versus aspirin. The Scandinavian Simvastatin Survival Study (4S) was a randomised trial of cholesterol lowering in 4444 patients with coronary artery disease. Some other drugs that do not improve prognosis include magnesium and antiarrhythmics like propafenone or flecainide.

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Responses Correct:	7
Responses Incorrect:	4
Responses Total:	11
Responses - % Correct:	64%

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A 72-year-old man is admitted with worsening congestive heart failure over the past 4 weeks. He is known to have dilated cardiomyopathy, which has been stabilised on drugs. His medication include digoxin 0.125 mg od, carvedilol 6.25 mg od, diuretics frusemide 40 mg od and losartan 50 mg od. On examination his blood pressure is 105/60 mmHg and his pulse rate is 102 bpm, regular. His JVP is raised and he has peripheral oedema. His respiratory rate is 25 breaths/min and he has bilateral crepitations.

How would you best manage this patient?

A	β -blockers should be permanently stopped
B	Increase the dose of digoxin
C	Add spironolactone (25 mg od) to his medication
D	Stop digoxin
E	Reduce the dose of losartan to 25 mg od

2518

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Explanation

The RALES trial showed that spironolactone (25 mg od) reduced mortality by 30% when added to conventional therapy. COPERNICUS (Carvedilol Prospective Randomised Cumulative Survival Trial) showed that carvedilol did improve survival and was well tolerated in patients with severe heart failure. There has been some debate about whether the beta-blocker should be discontinued in acute fluid overload. Evidence suggests (from the B-CONVINCED trial), that they can however be continued without significantly worsening shortness of breath. Results of the DIG trial (Digitalis Investigation Group) showed no difference in survival between the treatment arm and placebo, but it did reveal an increased hospitalisation and mortality rate on the withdrawal of digoxin. The SOLVD trial (Studies Of Left Ventricular Dysfunction) showed that enalapril improved survival in patients with heart failure. Recent evidence has supported the use of spironolactone in resistant hypertension, (PATHWAY-2), showing it as the most effective BP lowering medication in doses up to 50 mg.

http://eurheartj.oxfordjournals.org/content/ehj/early/2009/08/30/eu

2518

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Difficulty: Easy

Peer Responses %

Session Progress

Responses Correct:	7
Responses Incorrect:	5
Responses Total:	12
Responses - % Correct:	58%

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A 55-year-old man has been referred to the medical clinic by his GP. In his letter the GP says he is unsure whether the patient is really hypertensive because his blood pressure at his surgery is usually just borderline (ranges between 145 and 155/80 and 95 mmHg). He has a past medical history of benign prostatic hypertrophy but no history of any cardiovascular disorders. On examination his blood pressure is 130/85 mmHg and pulse 70 bpm and regular, his BMI is 34.

What would be the most appropriate step in the management of this patient?

A	Start the patient on an α-adrenergic blocker
B	Start patient on a β-blocker
C	Do nothing and just reassure the patient
D	Put the patient on an ambulatory 24-hour blood pressure monitor
E	Arrange for the patient to continue having his blood pressure checked every so often at the GP surgery

2519

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Normal Values

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A 55-year-old man has been referred to the medical clinic by his GP. In his letter the GP says he is unsure whether the patient is really hypertensive because his blood pressure at his surgery is usually just borderline (ranges between 145 and 155/80 and 95 mmHg). He has a past medical history of benign prostatic hypertrophy but no history of any cardiovascular disorders. On examination his blood pressure is 130/85 mmHg and pulse 70 bpm and regular, his BMI is 34.

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B	Start patient on a β-blocker
C	Do nothing and just reassure the patient
D	Put the patient on an ambulatory 24-hour blood pressure monitor
E	Arrange for the patient to continue having his blood pressure checked every so often at the GP surgery

Explanation

In such patients where the diagnosis is unclear, an ambulatory 24-hour blood pressure monitor may be helpful.

2519

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Difficulty: Average

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Session Progress

Responses Correct:	7
Responses Incorrect:	6
Responses Total:	13
Responses - % Correct:	54%

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An 82-year-old woman is being reviewed in the cardiology clinic. She has some residual weakness in her left hand from a thromboembolic stroke she sustained 3 months earlier. Unfortunately she is very independent and refused admission to the hospital then, having discharged herself from hospital after a head CT. There are no symptoms of breathlessness, orthopnoea or paroxysmal nocturnal dyspnoea (PND) and she has a good exercise tolerance. Her past medical history includes porcine aortic valve replacement 4 years earlier, hypertension and congestive heart failure. Her medication includes aspirin (started by her GP after a TIA affecting her right side 3 years ago), a ß-blocker, an ACE inhibitor and a statin. Her resting ECG shows sinus rhythm and a 72 hour holter confirms no paroxysmal AF.

What would be the next step in her management?

A	Commence warfarin
B	Start dipyridamole
C	Change aspirin to clopidogrel
D	Increase the dose of aspirin to 300 mg od
E	CT head

2594

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Calculator

Normal Values

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D	Increase the dose of aspirin to 300 mg od
E	CT head

Explanation

Guidance for anti-platelet therapy post stroke or TIA has recently been simplified. RCP guidelines from 2012 state that irrespective of whether the event is a stroke or TIA, clopidogrel is the optimal anti-platelet therapy.

Given this patient appears relatively fit, she should also be considered for further TIA investigation, including carotid dopplers.

2594

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Difficulty: Average

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Session Progress

Responses Correct:	7
Responses Incorrect:	7
Responses Total:	14
Responses - % Correct:	50%

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A 55-year-old man presents to emergency department with acute onset of crushing retrosternal chest pain that started 3 h ago. Other than hypertension, he has no past medical history of note. He has a pulse of 73 beats/min, blood pressure (BP) of 113/63 mmHg, jugular venous pulsation is seen up to 3 cm above the sternal notch and the chest is clear to auscultation. An electrocardiogram (ECG) shows ST segment elevation in leads V1 to V5. The patient receives chewable aspirin and thrombolytic therapy. Two hours after admission the ECG monitor shows Mobitz 2 second-degree heart block. The patient has a heart rate of 58 beats/min and blood pressure of 105/60 mmHg and denies any symptoms.

What is the best next step in this patient's management?

A	Temporary transvenous pacemaker
B	Atropine 0.5 mg
C	Temporary transcutaneous pacemaker
D	Angiography
E	No treatment required

6056

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Calculator

Normal Values

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E	No treatment required

Explanation

Mobitz type II block in the setting of an anterior myocardial infarction (MI) is associated with unstable escape rhythm and significant risk of progression to complete heart block with little warning. Therefore it is an indication for temporary transvenous pacing regardless of symptoms. Transcutaneous pacing is uncomfortable for the patient and should be avoided. Other indications for transvenous pacing in setting of acute MI are:

• asystole
• symptomatic sinus bradycardia or Mobitz I block not responding to atropine
• new bundle branch block (BBB) with first-degree heart block
• an old right BBB with first degree atrioventricular (AV) block and a new fascicular block

6056

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Difficulty: Easy

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Responses Correct:	7
Responses Incorrect:	8
Responses Total:	15
Responses - % Correct:	47%

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You are called by an obstetrician for evaluation of a 39-year-old Thai female in her 39th week of gestation. She is planned to undergo Caesarean section because of fetal distress due to placental abruption. On examination she appears an averagely built lady with body mass index of 27, heart rate of 95 bpm, blood pressure (BP) 132/78 mmHg and respiratory rate of 18/min. She has no jugular venous distension; her apex beat is in fifth intercostals space, midclavicular line, has a mid-systolic click and a late systolic murmur at apex radiating towards axilla. The rest of her physical examination is unremarkable except for gravid uterus.

She has no past medical history of note except for a history of skin wheals and pruritis following ingestion of amoxicillin. The symptoms resolved after treatment with chlorpheniramine maleate

Which of the following is the best regimen for endocarditis prophylaxis in this patient?

A	Ampicillin 2 g IV 30 min before operation
B	Vancomycin 1 g IV 60 min before operation
C	Clindamycin 600 mg IV 30 min before operation
D	Erythromycin 500 mg IV 30 min before procedure
E	No prophylaxis required

6058

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You are called by an obstetrician for evaluation of a 39-year-old Thai female in her 39th week of gestation. She is planned to undergo Caesarean section because of fetal distress due to placental abruption. On examination she appears an averagely built lady with body mass index of 27, heart rate of 95 bpm, blood pressure (BP) 132/78 mmHg and respiratory rate of 18/min. She has no jugular venous distension; her apex beat is in fifth intercostals space, midclavicular line, has a mid-systolic click and a late systolic murmur at apex radiating towards axilla. The rest of her physical examination is unremarkable except for gravid uterus.

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E	No prophylaxis required

Explanation

E	No prophylaxis required

The evidence in favour of antibiotic prophylaxis is limited, with no randomised trial. NICE guidelines (CG64: Prophylaxis against infective endocarditis) no longer recommend antibiotic prophylaxis for dental or respiratory procedures. They are only indicated for gastrointestinal and genitourinary procedures where there is a suspicion of pre-existing infection. In this case while a cardiac murmur is detected, there are no signs or symptoms from the clinical history suggestive of infective endocarditis.

A	Ampicillin 2 g IV 30 min before operation

NICE guidelines generally no longer recommend routine prophylaxis for valve lesions due to lack of evidence of benefit. In a patient with a potential penicillin allergy, ampicillin is not an appropriate choice of antibiotic.

B	Vancomycin 1 g IV 60 min before operation

The role for prophylactic antibiotics no longer features in NICE guideline recommendations. They are only recommended for gastrointestinal and genitourinary procedures where there is a suspicion of pre-existing infection. High-risk patients for infective endocarditis are identified by NICE guidelines (CG64: Prophylaxis against infective endocarditis), they include previous infective endocarditis, prosthetic valves, acquired valvular heart disease with stenosis or regurgitation, and structural congenital heart disease including surgically corrected or palliated structural conditions.

C	Clindamycin 600 mg IV 30 min before operation

Antibiotic prophylaxis is no longer recommended for valve lesions in accordance with NICE guidelines (2008). ESC guidelines (2009) only recommend antibiotics for those with the highest risk of infective endocarditis undergoing the highest-risk procedures. Antibiotic prophylaxis is no longer recommended for native valve disease, and is not indicated for respiratory, gastrointestinal or genitourinary procedures.

D	Erythromycin 500 mg IV 30 min before procedure

Erythromycin would not be an appropriate choice for infective endocarditis, and antibiotic prophylaxis is no longer recommended due to limited evidence. In this patient there are no signs of symptoms of infective endocarditis. If there is suspicion of infective endocarditis, a minimum of three blood culture sets are required before starting antibiotic therapy. In addition to an echocardiogram, early cardiology involvement and an infectious disease specialist are recommended.

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An 18-year-old college student presents with history of ingestion of 30 tablets of digoxin. On arrival his pulse rate is 44 bpm and regular, blood pressure 95/55 mmHg, no jugular venous distension, normal heart sounds and clear chest. He receives atropine 0.5 mg IV and his pulse rate increases to 58 bpm, and blood pressure improves to 105/60 mmHg. The patient is admitted to the coronary care unit, a nasogastric tube is placed and 75 g charcoal is administered through it.

His investigations reveal:

K^+	4.8 mmol/l
Na^+	139 mmol/l
Cl^-	99 mmol/l
Bicarbonate	22 mmol/l
Creatinine	99 mol/l
Digoxin	8.5 nmol/l

Electrocardiogram (ECG): sinus bradycardia at rate of 55 bpm. After half an hour the patient feels dizzy and heart rate drops to 45 bpm; another IV atropine 0.5 mg improves his heart rate to 55 bpm and symptoms resolve.

What is the most appropriate further treatment for this patient?

A	Isoproterenol infusion
B	Adrenaline infusion
C	Transcutaneous pacemaker
D	Temporary transvenous pacemaker
E	Digoxin-specific Fab fragment

6060

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Calculator

Normal Values

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A Isoproterenol infusion

B Adrenaline infusion

C Transcutaneous pacemaker

D Temporary transvenous pacemaker

E Digoxin-specific Fab fragment

Explanation

E Digoxin-specific Fab fragment

This patient has symptomatic recurrent bradycardia because of digoxin toxicity, although he has responded to atropine, Fab fragment should be administered to prevent recurrent bradycardia, as the effect of atropine will subside quickly.

Other indications for administration of digoxin-specific Fab Fragment are:

- haemodynamic instability
- life-threatening arrhythmias
- serum potassium >5 mmol/l in acute toxicity
- plasma digoxin level >13 nmol/l
- ingestion of more than 10 mg digoxin in adults and 4 mg in children.

A Isoproterenol infusion

For patients with symptomatic recurrent bradycardia secondary to digoxin toxicity, while isoprenaline may improve bradycardia, to reverse the effects of digoxin, digoxin-specific Fab fragment would be the most appropriate management.

B Adrenaline infusion

First-line treatment for bradycardia due to digoxin toxicity is digoxin-specific Fab fragment. Treatment should be guided by the patient's signs and symptoms and the toxic effects, not necessarily the digoxin level alone. Serum electrolytes should be reviewed for hyperkalaemia in acute toxicity and correction of hypokalaemia and hypomagnesaemia associated with chronic toxicity.

C Transcutaneous pacemaker

Digoxin-specific Fab fragment should be considered for patients with digoxin toxicity, with atropine being considered to block the digoxin-induced effects of increased vagal tone and reversing severe sinus bradycardia. Pacemaker use has now limited value, delay or insufficient administration of Fab can occur as well as pacing-induced arrhythmias.

D Temporary transvenous pacemaker

There is a risk of complications associated with pacing, therefore consider first-line management of digoxin-specific Fab fragment and administration of IV atropine for severe symptomatic bradycardia.

6060

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Difficulty: Easy

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Responses Correct:	7
Responses Incorrect:	10
Responses Total:	17
Responses - % Correct:	41%

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A 25-year-old man presents with history of ingestion of unknown quantity of digoxin. His pulse rate is 95 bpm and blood pressure 105/65 mmHg.

His investigations reveal:

K+	5.2 mmol/l
Na+	139 mmol/l
Cl^-	99 mmol/l
Bicarbonate	22 mmol/l
Creatinine	99 mol/l
Digoxin	8.5 nmol/l

Electrocardiogram (ECG): sinus rhythm rate of 95 pbm and multiple premature ventricular beats.

The patient is administered charcoal and digoxin-specific Fab fragment. After 10 minutes the ECG monitor shows ventricular tachycardia (VT). The patient is dizzy and sweaty, his blood pressure is 105/80 mmHg.

What is the most appropriate further treatment for this patient?

A	Synchronised direct current (DC) cardioversion
B	Asynchronised DC cardioversion
C	IV procainamide
D	IV amiodarone
E	IV lidocaine

6061

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Calculator

Normal Values

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A Synchronised direct current (DC) cardioversion

B Asynchronised DC cardioversion

C IV procainamide

D IV amiodarone

E IV lidocaine

Explanation

E IV lidocaine

The patient has ventricular tachycardia (VT) secondary to digoxin toxicity. The patient has been given digibind, therefore any cardiovascular instability is likely to improve significantly over several minutes. With the patient's blood pressure above 100, IV lidocaine (lignocaine) is the most appropriate management option. Phenytoin may also be used as an alternative to lidocaine (both are class IB agents) if immune therapy is unsuccessful or unavailable in the treatment of tachyarrhythmias secondary to digoxin toxicity.

A Synchronised direct current (DC) cardioversion

DC cardioversion is less successful in the setting of digoxin toxicity, although it may be considered in the event of significant cardiovascular instability.

B Asynchronised DC cardioversion

Synchronisation prevents the shock occurring on the T-wave (during repolorisation) therefore precipitating VF (ventricular fibrillation). Unsynchronised DC cardioversion may occur if the patient is pulseless or unstable and the defibrillator will not synchronise.

C IV procainamide

While IV procainamide can be used for management of ventricular tachycardia its limited availability makes it a less suitable choice in this scenario.

D IV amiodarone

Amiodarone should be used cautiously due to its cutaneous effects and serious consequences if extravasation occurs; therefore administration should be via a central venous if possible. The therapeutic effects of amiodarone compared with other anti-arrhythmic agents may take longer, in addition to the potential toxic effects of amiodarone. Therefore, IV lidocaine is preferable.

6061

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Difficulty: Difficult

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Responses Correct:	7
Responses Incorrect:	11
Responses Total:	18
Responses - % Correct:	39%

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A 48-year-old woman with a mitral valve prosthesis for the last 5 years presents with severe shortness of breath. The shortness of breath started a few days ago but has rapidly worsened for past 2 hours. The patient had not taken her warfarin for the past 5 days. On examination the patient is sitting up in the bed, pulse rate is 110 bpm, blood pressure 78/55 mmHg; jugular venous pulsations are seen up to the angle of the jaw, heart sounds are muffled and inspiratory crackles can be heard all over the chest. Urgent transthoracic echocardiography is ordered; though the visualisation is poor, it suggests a thrombus attached to the mitral prosthesis.

What is the next management step for this patient?

A	IV alteplase
B	IV heparin infusion
C	Immediate valve replacement
D	Transoesophageal echocardiography (TEE)
E	Check her international normalised ratio (INR)

6062

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Calculator

Normal Values

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A	IV alteplase
B	IV heparin infusion
C	Immediate valve replacement
D	Transoesophageal echocardiography (TEE)
E	Check her international normalised ratio (INR)

Explanation

A	IV alteplase

The patient has a prosthetic valve thrombosis (PVT) resulting in shock. This complication occurs in 0.03–5.5% annually with equal frequency in bioprosthesis and mechanical valves. It is more common in mitral prosthesis and with subtherapeutic anticoagulation. If the patient is haemodynamically unwell (ie pulmonary oedema or hypotension) and no immediate surgery is available, thrombolytic therapy should be given. Serial echocardiography should be performed, and if the response is inadequate repeat thrombolytic therapy can be given.

B	IV heparin infusion

If patients are haemodynamically stable and have a subtherapeutic anticoagulation in the context of a prosthetic valve thrombosis, Heparin ± aspirin can be administered with regular follow-up if successful. In this case however, the patient is haemodynamically unstable due to a prosthetic valve thrombosis secondary to likely subtherapeutic anticoagulation; therefore urgent thrombolysis should be considered.

C	Immediate valve replacement

In stable patients, surgery is a better option for left-sided PVT, while right-sided PVT should be treated with thrombolytic agents. Surgery may be considered if patients are critically ill and immediate surgery is available; however an evaluation of risks and benefits must be sought, and in this acute scenario thrombolytic therapy should be administered.

D	Transoesophageal echocardiography (TEE)

While TEE is the best diagnostic modality, transthoracic echocardiography is the initial choice in sick patients, and then if the diagnosis is not confirmed, a TEE can be done.

E	Check her international normalised ratio (INR)

Given the acute presentation in the context of a mitral valve prosthesis and the patient having not taken her warfarin for past 5 days, investigation should be focussed on exclusion of a prosthetic valve thrombosis. Transthoracic/transoesophageal echo should be primary investigations with early therapeutic intervention.

6062

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Difficulty: Easy

Peer Responses %

Session Progress

Responses Correct:	7
Responses Incorrect:	12
Responses Total:	19
Responses - % Correct:	37%

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A 56-year-old Indian male presents with history of shortness of breath on exertion of three months' duration. For the last month he has been unable to walk one block without getting short of breath. He has also noticed swelling of his feet. On physical examination he has jugular venous distension, low volume pulse of 95/min, blood pressure 95/60 mmHg, a harsh ejection systolic murmur at the aortic area, left-sided third heart sound (S3) gallop and inspiratory crackles at both lung bases. He has been diabetic and hyperlipidaemic for the past 6 years and his medications include aspirin 100 mg a day, fosinopril 20 mg a day and metformin 850 mg three times a day.
An echocardiogram is ordered that reveals severe left ventricular (LV) dysfunction with ejection fraction (EF) of 28%, a calcified aortic valve with a calculated aortic valve area of 0.6 cm^2 and transaortic gradient of 30 mmHg.

What is the next best step in this patient's management?

A	Aortic valve replacement (AVR)
B	Aortic balloon valvotomy
C	Discontinue fosinopril
D	Repeat echocardiography with dobutamine infusion
E	Add beta-blockers and diuretics with follow-up echocardiography in six months

6063

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Calculator

Normal Values

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C	Discontinue fosinopril
D	Repeat echocardiography with dobutamine infusion
E	Add beta-blockers and diuretics with follow-up echocardiography in six months

Explanation

This patient has severe left ventricular (LV) dysfunction, and calculated valve area in such patients can be falsely low because low cardiac output reduces the valve opening forces. It is important to distinguish patients with true severe aortic stenosis (AS) with secondary LV dysfunction from those who have a falsely low calculated aortic valve area because of low cardiac output. An important method of distinguishing between the two conditions is to assess the haemodynamics after increasing the cardiac output by dobutamine infusion during echocardiography or cardiac catheterisation. Patients with truly severe AS manifest an increase in transaortic pressure gradient while the valve surface area remains the same during dobutamine infusion; while those with falsely low calculated valve area manifest an increase in calculated valve surface area. Dobutamine echocardiography is also important to assess LV contractile reserve. Patients who have 20% or more increase in stroke volume after dobutamine infusion have a much better prognosis after surgery compared to those who do not have LV contractile reserve.

6063

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Difficulty: Difficult

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Responses Correct:	7
Responses Incorrect:	13
Responses Total:	20
Responses - % Correct:	35%

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A 33-year-old woman presents with a history of progressive dyspnoea of 2 weeks' duration sometimes associated with palpitations. She has also noticed increased swelling of her feet and abdomen and decreased effort tolerance. She denies any chest pain, fever, rhinorrhoea, sore throat or rash. She is pregnant in her 36th week of gestation and has no past medical history of note, does not take alcohol or any other drugs. Examination of the cardiovascular system during prenatal visits has been normal. Electrocardiogram (ECG) and chest X-ray performed a year ago during a pre-employment check up were normal. Physical examination reveals pulse rate of 98 bpm, respiratory rate 22/min, blood pressure 110/60 mmHg, jugular venous distension, a summation gallop and bilateral inspiratory crackles up to one-third of the chest posteriorly. ECG shows sinus tachycardia and echocardiography reveals diffuse left ventricular (LV) hypokinesia with an ejection fraction of 25%. The patient is started on digoxin 0.125 mg per day, furosemide 60 mg twice daily and hydralazine 25 mg twice daily.

Which of the following medications is most important to add to the above regimen?

A	Heparin
B	Carvedilol
C	Enalapril
D	Nitroglycerine
E	Methylprednisolone

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A 33-year-old woman presents with a history of progressive dyspnoea of 2 weeks' duration sometimes associated with palpitations. She has also noticed increased swelling of her feet and abdomen and decreased effort tolerance. She denies any chest pain, fever, rhinorrhoea, sore throat or rash. She is pregnant in her 36th week of gestation and has no past medical history of note, does not take alcohol or any other drugs. Examination of the cardiovascular system during prenatal visits has been normal. Electrocardiogram (ECG) and chest X-ray performed a year ago during a pre-employment check up were normal. Physical examination reveals pulse rate of 98 bpm, respiratory rate 22/min, blood pressure 110/60 mmHg, jugular venous distension, a summation gallop and bilateral inspiratory crackles up to one-third of the chest posteriorly. ECG shows sinus tachycardia and echocardiography reveals diffuse left ventricular (LV) hypokinesia with an ejection fraction of 25%. The patient is started on digoxin 0.125 mg per day, furosemide 60 mg twice daily and hydralazine 25 mg twice daily.

Which of the following medications is most important to add to the above regimen?

A	Heparin
B	Carvedilol
C	Enalapril
D	Nitroglycerine
E	Methylprednisolone

Explanation

A Heparin

This patient has presented with heart failure in 36th week of pregnancy. She had no prior evidence of heart disease or any identifiable cause of heart failure. This satisfies the clinical criteria for diagnosis of peripartum cardiomyopathy (PPCM). Therapy of PPCM involves sodium restriction, diuretics to optimise the volume status, digoxin and afterload-reducing agents.

Patients with PPCM are at risk of thromboembolism due to both hypercoagulable state of pregnancy and stasis of blood in the left ventricle. Therefore, anticoagulation with heparin or warfarin is recommended, although of course warfarin is contraindicated in late pregnancy; therefore heparin is preferred to minimise risk of embolic stroke.

B Carvedilol

For patients presenting with PPCM, defined as left ventricular systolic dysfunction 1 month prior to delivery or 5 months postpartum, volume status should first be managed with diuretics after liaison with obstetricians. Beta-blockers should be added once the patient's volume status is optimised.

C Enalapril

Management of PPCM includes sodium restriction, diuretics to optimise the volume status, digoxin and afterload-reducing agents. Angiotensin-converting enzyme inhibitors are contraindicated during pregnancy, particularly first trimester, therefore hydralazine is preferred.

D Nitroglycerine

Nitrates are generally not recommended during pregnancy. A combination of diuretics and supportive measures, together with thromboprophylaxis due to the high risk of embolic stroke, is administered.

E Methylprednisolone

Empirical use of immunosuppressive therapy has not been found to be beneficial for management of PPCM. Risks to the fetus during PPCM include low birth weight and prematurity, with subsequent pregnancies monitored closely due to risk of recurrence.

6067

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Responses Correct:	7
Responses Incorrect:	14
Responses Total:	21
Responses - % Correct:	33%

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A 62-year-old accountant presents with history of pain in both calves. The pain starts after walking three blocks, is described as cramping and is relieved by rest. He has been a known hypertensive for the last 10 years, on bisoprolol 10 mg a day. He has a 40-pack year history of smoking but stopped 2 years ago. A treadmill exercise test done two years ago was normal. He does not have any other past medical history of note.
On physical examination he has body mass index of 26, blood pressure of 125/75 mmHg, heart rate 75 beats/min, bilateral femoral bruits and absent dorsalis pedis pulses. Examination of the heart and respiratory system is normal.

Lipid profile results show:

Total cholesterol	5.6 mmol/l
Low-density lipoprotein (LDL)	cholesterol 3.5 mmol/l
High-density lipoprotein (HDL)	cholesterol 1.2 mmol/l
Triglycerides	2.8 mmol/l

The patient is advised to continue bisoprolol 10 mg a day, and is also started on aspirin 100 mg a day, cilostazol 100 mg twice a day, low fat diet and a supervised exercise training programme. On follow-up visit three months later his symptoms have improved and he is now able to walk five blocks without symptoms.

A repeat lipid profile shows:

Total cholesterol	5.0 mmol/l
LDL cholesterol	3.2 mmol/l
HDL cholesterol	1.3 mmol/l
Triglycerides	2.4 mmol/l

Which of the following is the next best step in this patient's management?

A	Start a statin with a target LDL of less than 2.0 mmol/l
B	Stop bisoprolol
C	Start angiotensin-converting enzyme inhibitor to keep blood pressure below 120/70 mmHg
D	Start nitroglycerine
E	Start a statin with a target LDL of less than 2.9 mmol/l

6068

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B	Stop bisoprolol
C	Start angiotensin-converting enzyme inhibitor to keep blood pressure below 120/70 mmHg
D	Start nitroglycerine
E	Start a statin with a target LDL of less than 2.9 mmol/l

Explanation

The answer is - Start a statin with a target LDL of less than 2.0 mmol/l

Patients with peripheral arterial disease have an increased risk of adverse cardiovascular event and frequently have coexistent coronary and cerebrovascular atherosclerosis; therefore it is considered a coronary artery disease equivalent. For this reason an appropriate statin should be commenced. Currently the recommended target is LDL less than 2.0 mmol/l, hence the correct answer. Beta-blockers do not significantly impair the walking capacity in most patients and considering their favorable affect on coronary artery disease, need not be stopped. Cardioselective beta blockers such as bisoprolol have a better side-effect profile in this respect.

6068

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Session Progress

Responses Correct:	7
Responses Incorrect:	15
Responses Total:	22
Responses - % Correct:	32%

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A 55-year-old woman presents with history of tiredness and decreased effort tolerance of 3 months' duration. She has 5-years history of hypertension controlled on indapamide slow-release 1.5 mg a day. She is a lifelong non-smoker and has no family history of premature coronary artery disease. Her lipid profile checked 6 months earlier was normal. She has no other past medical history of note. Physical examination reveals an irregular pulse at rate of 95 bpm, blood pressure 135/80 mmHg, no jugular venous distension, apex beat in the 5th intercostal space, normal heart sounds without any murmur.

Investigations reveal:

Hb	14 g/dl
K^+	4.4 mmol/L
Na^+	138 mmol/l
Creatinine	85 mol/l
Thyroid-stimulating hormone (TSH)	1.3 IU/l (0.4–5)
Free thyroxine (T4)	13pmol/l (10–22)
Electrocardiogram (ECG)	Atrial fibrillation with ventricular rate of 108/min
Echocardiography	Left ventricular (LV) ejection fraction 58%, left atrial diameter 4.6 cm, concentric LV hypertrophy and trivial mitral regurgitation

She is started on low molecular weight heparin. Which of the following treatments would you institute next?

A	Aspirin
B	Aspirin and dipyramidole
C	Dipyridamole MR
D	Clopidogrel
E	Warfarin

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Normal Values

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B Aspirin and dipyramidole

C Dipyridamole MR

D Clopidogrel

E Warfarin

Explanation

E Warfarin

NICE guidelines (CG180: Management of atrial fibrillation) advocate rhythm control should be initiated in this patient. The duration of atrial fibrillation (AF) is uncertain, therefore the first step should be adequate anticoagulation with warfarin or a non-vitamin K oral anticoagulant (NOAC), eg rivaroxaban, apixaban, dabigatran. This should be continued for at least 3 weeks prior to DC cardioversion. Anticoagulation may be continued thereafter given her increased left atrial size and mitral regurgitation.

A Aspirin

Aspirin has no role in the anticoagulation of patients in atrial fibrillation. In this clinical case, her CHA2DS2-VASc score for AF is 2, therefore conveying an annual risk of stroke of 2.2%, therefore anticoagulation with warfarin or a non-vitamin K oral anticoagulant (NOAC), eg rivaroxaban, apixaban, dabigatran, is recommended.

B Aspirin and dipyramidole

A patient's bleeding risk must be considered before commencing anticoagulation of AF; the HADBLED score can be used to assess this. Studies showing aspirin with the addition of another antiplatelet was worse than warfarin alone in stroke prevention, with an increased risk of bleeding compared with warfarin.

C Dipyridamole MR

Dipyridamole MR has no role in the reduction of stroke in patients with AF alone. If anticoagulation is required, Warfarin or the non-vitamin K oral anticoagulants (NOAC), eg rivaroxaban, apixaban, dabigatran, should be initiated after consultation with the patient. If patients have a mechanical valve or moderate-to-severe mitral stenosis, then warfarin should be the first choice, as NOACs are contraindicated in these conditions.

D Clopidogrel

Warfarin and the non-vitamin K Oral anticoagulants (NOAC), eg rivaroxaban, apixaban, dabigatran, provide a greater benefit with regard to stroke prevention compared with clopidogrel alone. The CHA2DS2-VASc score provides guidance together with informed decision making with patients regarding anticoagulation. Patients with a CHA2DS2-VASc score greater or equal to 1 (provided the risk factor is not gender) should be considered for anticoagulation.

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Responses Correct:	7
Responses Incorrect:	16
Responses Total:	23
Responses - % Correct:	30%

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A 24-year-old woman presents with exertional breathlessness. Echocardiography reveals a congenital bicuspid aortic valve. She wishes to start a family.

What would be the most appropriate treatment for her valve problem?

A	Tell her to avoid pregnancy
B	Consider her for valvuloplasty
C	Refer for a metal valve replacement before pregnancy
D	Refer for a porcine valve replacement before pregnancy
E	Delay valve replacement until after pregnancy

6515

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Normal Values

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A	Tell her to avoid pregnancy
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C	Refer for a metal valve replacement before pregnancy
D	Refer for a porcine valve replacement before pregnancy
E	Delay valve replacement until after pregnancy

Explanation

Pregnancy will greatly increase the required cardiac output and lead to a rapid worsening of symptoms. Congenital aortic stenosis is the major cause in patients presenting with symptoms under the age of 30 years. Valvotomy is reserved for patients unsuitable for surgery; metal valve replacements require warfarinisation and as such would be unsuitable in this patient as warfarin is teratogenic in early pregnancy and not advised in late pregnancy because of the risk of haemorrhage. Presence of a metallic valve would therefore necessitate switching to LMW heparin at some stage in pregnancy. This leaves a porcine valve replacement before pregnancy as the best option. Untreated aortic stenosis has an average five-year survival rate of only 40%.

6515

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Responses Correct:	7
Responses Incorrect:	17
Responses Total:	24
Responses - % Correct:	29%

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A 54-year-old company director presents to the Emergency Department with an episode of retrosternal chest pain lasting 15 minutes while playing squash. He went home after the event but his wife persuaded him to attend. There have been two similar episodes, one 6 months ago when he was walking the dog on a cold morning, and another 3 months ago when he got a short period of indigestion type pain while running on the treadmill. He stopped smoking 3 years ago but has no other specific past medical history.

Review 12 hours after presentation shows:

ECG	T wave inversion v4 – v6
creatine kinase	420 u/l
3 hour troponin	<0.03

Which of the following diagnoses fit best with this clinical picture?

A	Non-cardiac chest pain
B	N-STEMI
C	STEMI
D	Stable angina
E	Unstable angina

6516

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C	STEMI
D	Stable angina
E	Unstable angina

Explanation

D	Stable angina

Angina pectoris is described as a constricting discomfort experienced retrosternally, or in the jaw, shoulders, arms or neck. It is precipitated by exertion and relieved by rest or GTN. Creatine kinase while raised is not specific for cardiac muscle damage, and can be associated with vigorous exercise. Troponin, on the other hand, is specific for cardiac muscle. Levels depend upon local biochemistry departments, with high levels indicating varying degrees of myocardial necrosis and should drive further investigations/more aggressive management in accordance with NICE guidelines CG126: Stable angina management. In the context of a troponin here which is less than 0.03 (ie negative), it is likely that the electrocardiogram changes are reflective of stable angina; it is the troponin which stratifies him in the lower risk group.

A	Non-cardiac chest pain

The differential diagnosis for chest pain is extensive with respiratory, gastrointestinal, neuromusculoskeletal and psychogenic causes to be considered. In this scenario, retrosternal chest pain precipitated by exertion in a patient with a significant smoking history and resting ECG changes consistent with ischaemia, cardiac investigation and management should be initiated. Non-cardiac chest pain is a diagnosis of exclusion.

B	N-STEMI

The European Society of Cardiology defines NSTEMI as acute chest pain but without persistent ST-elevation. ECG changes may resemble ST depression, T-wave inversion, T-wave flattening or no ECG changes. If the troponin is elevated or shows a significant rise, then non-ST elevation myocardial infarction is diagnosed. In this clinical case, while ECG changes are present, normal troponins exclude the diagnosis of NSTEMI

C	STEMI

ST-elevation myocardial infarction (STEMI) is defined by the European Society of Cardiology as typical acute chest pain and persistent (>20 minutes) ST elevation on the ECG. Urgent intervention is required with reperfusion therapy.

E	Unstable angina

Unstable angina is similar to the NSTEMI definition of acute chest pain but without persistent ST-elevation; however patients have negative cardiac biomarkers. This patient is experiencing chest pain typically on exertion, whereas unstable angina may present at rest, with increasing frequency/severity and may last longer than stable angina.

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Responses Incorrect:	18
Responses Total:	25
Responses - % Correct:	28%

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A 48-year-old builder was admitted with chest pain which came on after carrying a pile of bricks. 48 hours later he is pain free. His electrocardiogram shows T-wave inversion in leads V2 to V6. Troponin T was 0.07 (normal <0.05)

Which of the following represents the best management for this patient?

A	Arrange coronary angiogram
B	Arrange inpatient excercise stress test
C	Start to mobilise and if he is pain free he can be discharged
D	Discharge now and see him in clinic 4–6 weeks' time
E	Arrange outpatient treadmill test (stress test) in 4–6 weeks' time and discharge him now

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Normal Values

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D	Discharge now and see him in clinic 4–6 weeks' time
E	Arrange outpatient treadmill test (stress test) in 4–6 weeks' time and discharge him now

Explanation

A	Arrange coronary angiogram

This patient has an abnormal troponin T, which at above 0.05 now puts him into the range considered to be a myocardial infarction, with the T-wave inversion indicating a non-ST elevation event. Percutaneous coronary intervention (PCI) is recommended for NSTEMI and unstable angina (NICE, CG94: Unstable angina and NSTEMI: early management). Ideally, he should be subject to definitive coronary artery evaluation and the best way to do this is via coronary angiography following a careful risk benefit analysis after risk stratification (GRACE score).

B	Arrange inpatient excercise stress test

In view of the abnormal troponin T, inpatient exercise testing should be avoided; this has been endorsed by recent NICE guidance.

C	Start to mobilise and if he is pain free he can be discharged

Management of patients presenting with NSTEMI or unstable angina is recommended as invasive assessment with coronary angiography and subsequent reperfusion providing no contraindications.

D	Discharge now and see him in clinic 4–6 weeks' time

Immediately following a myocardial infarction this would be inappropriate given the clinical presentation. Risk stratification is recommended, using an appropriate scoring system, ie GRACE score, together with consideration for angiography and revascularisation following acute coronary syndrome.

E	Arrange outpatient treadmill test (stress test) in 4–6 weeks' time and discharge him now

In troponin-negative patients, non-invasive investigation for patients stratified as low or intermediate risk with uncertain diagnosis may be appropriate. In this case given the clinical history, raised troponin and ECG changes, coronary artery evaluation should be considered via coronary angiography.

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Responses Correct:	7
Responses Incorrect:	19
Responses Total:	26
Responses - % Correct:	27%

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A 35-year-old man is being treated for end-stage cardiomyopathy following viral infection. His current medication includes aspirin, bisoprolol, ramipril and furosemide. There is still evidence of cardiac failure. Echocardiography 3 months earlier revealed an ejection fraction of only 31%.

Which of the following medications has the best evidence with respect to a survival benefit

A	Spironolactone
B	Digoxin
C	Bendrofluazide
D	Warfarin
E	Bumetanide

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Which of the following medications has the best evidence with respect to a survival benefit

A	Spironolactone
B	Digoxin
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D	Warfarin
E	Bumetanide

Explanation

A	Spironolactone

For patients with chronic heart failure with NYHA II–IV already taking a β-blocker, angiotension-converting enzyme (ACE) inhibitor and loop diuretics, an aldosterone antagonist such as spironolactone is recommended. The RALES study demonstrated benefit of adding spironolactone in these patients with severe heart failure and ejection fraction below 35%. The study showed a relative risk of 0.7 for all-cause mortality in the group taking spironolactone. The study used low-dose spironolactone at a dose of 25 mg per day.

The PARADIGM-HF study demonstrated benefit of dual inhibition of the renin–angiotensin–aldosterone system and neprolysin inhibition compared with ACE inhibitors alone. The dual inhibitors better known as Entresto (valsartan/sacubitril) represent a major development in heart failure treatment; the new combination can be used instead of an ACE inhibitor or angiotensin receptor blocker for treatment of patients with heart failure with reduced ejection fraction.

B	Digoxin

Digoxin is indicated in patients with an ejection fraction <40%, NYHA II–IV and on optimal dose of β-blocker, ACE inhibitor or ARB, and aldosterone antagonist. Therefore, addition of spironolactone is recommended before digoxin. Digoxin is also indicated in patients with atrial fibrillation, particularly if ventricular rate at rest is >80 bpm or at exercise is >110–120 bpm.

C	Bendrofluazide

Diuretics are used for symptomatic relief and clinical signs of pulmonary and systemic venous congestion. Loop diuretics are usually required in moderate to severe heart failure. Thiazide diuretics may be used in addition to a loop diuretic for resistant oedema; typically metolazone is cautiously used in this instance.

D	Warfarin

Warfarin has no role in the management of heart failure alone, it may be considered in patients with a diagnosis of atrial fibrillation as stroke prophylaxis.

E	Bumetanide

Bumetanide is a loop diuretic and can be used instead of furosemide given its increased bioavailability; however it is used for relief of symptoms and signs of congestion rather than to improve the ejection fraction. In patients with NYHA II–IV and left ventricular ejection fraction <35% together with a QRS duration >120 ms, cardiac resynchronisation therapy (CRT) may be considered following specialist review (see NICE guidelines for full criteria).

6532

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Responses Correct:	7
Responses Incorrect:	20
Responses Total:	27
Responses - % Correct:	26%

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A 55-year-old heavy smoker presented to the Emergency Department with severe anterior chest pain. An electrocardiogram (ECG) on admission revealed no ST segment changes and he was started on aspirin and low molecular weight heparin pending troponin results. Six hours later he develops more severe pain and has ST 2.5 mm elevation in leads V3 to V6.

What is the management of choice?

A	Start him on ß-blockade
B	Arrange urgent (immediate)angiography +/- angioplasty and stenting
C	Start a IIb IIIa receptor antagonist
D	Start streptokinase
E	Start tenecteplase

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C	Start a IIb IIIa receptor antagonist
D	Start streptokinase
E	Start tenecteplase

Explanation

B	Arrange urgent (immediate)angiography +/- angioplasty and stenting

Primary angioplasty where available is the treatment of choice in this case of ST-elevation myocardial infarction to restore flow to the occluded coronary artery. A number of studies have demonstrated its superiority over thrombolysis.

A	Start him on ß-blockade

While β-blockers have been shown to provide a significant mortality benefit in management of acute coronary syndrome, in this patient with acute ST-elevation myocardial infarction, urgent reperfusion therapy is required for all patients.

C	Start a IIb IIIa receptor antagonist

If the chest pain was associated with ST depression, then a IIb IIIa antagonist would be the correct answer. For patients presenting with ST-elevation myocardial infarction, IIb IIIa antagonists may be used as an adjunct to primary angioplasty; however angioplasty remains the definitive treatment of choice.

D	Start streptokinase

For patients with ST-elevation acute coronary syndrome, primary angioplasty or reperfusion with a fibrinolytic is the recommended immediate management. Several important research studies have demonstrated primary percutaneous coronary intervention (PPCI) as being superior to thrombolysis; however if primary angioplasty is unavailable, thrombolytic therapy may be considered. In this case, arranging urgent (immediate) angiography ± angioplasty and stenting is the most appropriate choice.

E	Start tenecteplase

If angioplasty is not available, then tenecteplase would be the best choice for thrombolysis. Tissue plasminogen activator (TPA) has been shown to achieve better vessel patency than streptokinase in anterior myocardial infarction.

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Responses Correct:	7
Responses Incorrect:	21
Responses Total:	28
Responses - % Correct:	25%

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You review a 78-year-old woman who has collapsed while at morning service in church. This has been her third episode of collapse in recent months. On admission to the Emergency Department she is hypotensive at 90/70 mmHg and has a pulse rate of 38 bpm. Electrocardiogram (ECG) reveals atrial fibrillation with a ventricular rate of 40 bpm. There is a past medical history of hypertension and chronic obstructive airway disease. Medication includes seretide inhaler and ramipril for blood pressure. Review of previous casualty cards reveals one other documented bradycardic collapse and an admission with fast atrial fibrillation at a ventricular rate of 135 bpm.

Which of the following represents the most appropriate long-term therapy for this lady?

A	Verapamil
B	Sotalol
C	Amiodarone
D	Permanent pacemaker
E	Digoxin

6553

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D	Permanent pacemaker
E	Digoxin

Explanation

D Permanent pacemaker

The patient has sinus node dysfunction or 'sick sinus syndrome' as the cause for her atrial arrhythmia and episodes of bradycardia and tachycardia. In this condition, symptomatic bradycardia and syncope are both ESC Class I indications for a permanent implantable pacemaker. Dual-chamber pacemakers (DDD) are usually implanted, however patients with atrial fibrillation usually receive a single chamber device (VVI).

A Verapamil

Verapamil is a rate-limiting calcium channel blocker, therefore it would worsen the bradycardia and so is not a suitable option for treatment.

B Sotalol

Sotolol is a non-competitive β-blocker which exhibits Class III anti-arrhythmic actions. Adverse effects include bradycardia, therefore it would not be appropriate in this case of symptomatic bradycardia.

C Amiodarone

Amiodarone is a class III anti-arrhythmic used for treatment of ventricular tachycardias, ventricular fibrillation, atrial fibrillation with a fast ventricular rate and supraventricular tachycardias. While its main use is to cardiovert patients, it exhibits β-blocker and calcium channel blocker effects, therefore making it unsuitable for bradycardic patients. Due to its numerous side effects it is not a suitable long-term option.

E Digoxin

Digoxin is a cardiac glycoside and while it can be used to slow atrial fibrillation with a fast ventricular rate, its use in bradycardia would exacerbate the patient's condition.

6553

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Responses Correct:	7
Responses Incorrect:	22
Responses Total:	29
Responses - % Correct:	24%

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A 68-year-old lady has had more than three readings of blood pressure (BP) 175/65 mmHg during the past month. She is obese with a body mass index of 34. On further questioning she admits to shortness of breath on minimal exercise, and occasionally she wakes in the night very short of breath and has to open the windows. She does not report suffering from any excessive sleepiness in the daytime, and is able to maintain her job as a busy PA.

Which of the following would be the most appropriate initial therapy in this patient?

A	Ramipril
B	Atenolol
C	Bendrofluazide
D	Doxazosin
E	Bisoprolol

6554

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Calculator

Normal Values

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A 68-year-old lady has had more than three readings of blood pressure (BP) 175/65 mmHg during the past month. She is obese with a body mass index of 34. On further questioning she admits to shortness of breath on minimal exercise, and occasionally she wakes in the night very short of breath and has to open the windows. She does not report suffering from any excessive sleepiness in the daytime, and is able to maintain her job as a busy PA.

Which of the following would be the most appropriate initial therapy in this patient?

A	Ramipril
B	Atenolol
C	Bendrofluazide
D	Doxazosin
E	Bisoprolol

Explanation

A	Ramipril

While NICE guidelines recommend calcium channel blockers in the over 55 age group, her obesity and heart failure would drive you towards ramipril. Her shortness of breath may be indicative of left ventricular dysfunction, therefore ramipril would be the best choice. Meta-analyses have suggested that ARBs or ACEIs are associated with the lowest incidence of diabetes.

NICE guidelines recommend clinic blood pressure and subsequent ambulatory blood pressure monitoring for diagnosis of hypertension. Screening for complications, ie target organ damage, is required, including ECG to exclude left ventricular hypertrophy or previous cardiovascular events, urine dip for protein, renal function and hypertensive retinal changes.

In addition to lifestyle modification, medication can be initiated in this case of grade 2 hypertension.

B	Atenolol

Beta-blockers are not recommended for initial treatment of uncomplicated hypertension owing to conflicting evidence on their benefit. The majority of evidence for β-blockers in hypertensive management is based upon atenolol.

C	Bendrofluazide

Given this patient has signs suggestive left ventricular impairment, an ACE inhibitor would be preferred over a thiazide diuretic such as bendroflumethiazide. Thiazide-like diuretics are now a more favourable alternative to the traditional thiazides, with them being particularly effective for antihypertensive treatment when used in combination therapy. Side effects include hyperuricaemia, hyperglycaemia, hyponatraemia and hypokalaemia.

D	Doxazosin

Alpha-blockers are not recommended because in the ALLHAT trial, treatment with doxazocin resulted in worse outcomes leading to early termination in the treatment arm.

E	Bisoprolol

Atenolol is the β-blocker upon which the majority of evidence for antihypertensive treatment is based. The ASCOT study reported that the use of β-blockers and thiazides increased the risk of new-onset type 2 diabetes, therefore they would not be the preferred option this scenario.

6554

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Difficulty: Average

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Session Progress

Responses Correct:	7
Responses Incorrect:	23
Responses Total:	30
Responses - % Correct:	23%

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A 42-year-old man presents with an episode of chest pain following a vigorous game of squash. On admission to the Emergency Department he admits to a previous episode after jogging a few weeks earlier. He smokes five cigarettes per day and drinks 25 units of alcohol per week. His father died suddenly at the age of 42, his brother died at the age of 21. On examination there is a systolic murmur loudest at the left sternal border and a fourth heart sound. Electrocardiogram (ECG) reveals left ventricular hypertrophy. Echocardiography reveals a thickness ratio, (septum to left ventricular wall) of 1.5 : 1.

What diagnosis fits best with this clinical picture?

A	Alcoholic cardiomyopathy
B	Aortic stenosis
C	Hypertrophic obstructive cardiomyopathy (HOCM)
D	Coronary artery disease
E	Restrictive cardiomyopathy

6555

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Calculator

Normal Values

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A 42-year-old man presents with an episode of chest pain following a vigorous game of squash. On admission to the Emergency Department he admits to a previous episode after jogging a few weeks earlier. He smokes five cigarettes per day and drinks 25 units of alcohol per week. His father died suddenly at the age of 42, his brother died at the age of 21. On examination there is a systolic murmur loudest at the left sternal border and a fourth heart sound. Electrocardiogram (ECG) reveals left ventricular hypertrophy. Echocardiography reveals a thickness ratio, (septum to left ventricular wall) of 1.5 : 1.

What diagnosis fits best with this clinical picture?

Your answer was correct

A	Alcoholic cardiomyopathy
B	Aortic stenosis
C	Hypertrophic obstructive cardiomyopathy (HOCM)
D	Coronary artery disease
E	Restrictive cardiomyopathy

Explanation

Familial HOCM occurs as an autosomal dominant condition with variable penetrance. Symptoms may include dyspnoea, syncope, angina or palpitations. Unfortunately the condition is also associated with increased risk of lethal arrhythmias and sudden death. Chest X-ray examination may reveal normal or increased heart size. Electrocardiogram (ECG) shows left ventricular hypertrophy and there are often Q waves in anterolateral and inferior leads. Echocardiography reveals increased septal versus left ventricular wall diameter (diameter ratio of >1.3 : 1). Surgical resection of myocardial tissue is an option where the outflow gradient is increased. Amiodarone is useful for arrhythmia prophylaxis; implantable cardioverter/defibrillator may be an option in patients with recurrent ventricular tachycardia.

6555

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Difficulty: Average

Peer Responses %

Session Progress

Responses Correct:	8
Responses Incorrect:	23
Responses Total:	31
Responses - % Correct:	26%

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A 42-year-old man who was previously fit and well developed short-lived pleuritic-sounding chest pain while playing squash one evening. The following morning he attends the Emergency Department at the insistence of his wife. Investigation shows a normal electrocardiogram (ECG), creatine kinase (CK) and troponin T. Chest X-ray is unremarkable.

What diagnosis fits best with this clinical picture?

A	Non-cardiac chest pain
B	Unstable angina
C	Stable angina
D	STEMI
E	N-STEMI

6556

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Calculator

Normal Values

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A 42-year-old man who was previously fit and well developed short-lived pleuritic-sounding chest pain while playing squash one evening. The following morning he attends the Emergency Department at the insistence of his wife. Investigation shows a normal electrocardiogram (ECG), creatine kinase (CK) and troponin T. Chest X-ray is unremarkable.

What diagnosis fits best with this clinical picture?

Your answer was correct

A	Non-cardiac chest pain
B	Unstable angina
C	Stable angina
D	STEMI
E	N-STEMI

Explanation

A	Non-cardiac chest pain

Normal ECG, CK and troponin T makes the diagnosis of cardiac chest pain very unlikely. If high-sensitivity troponin is negative at 12 hours it indicates a very low cardiovascular risk. Troponin elevation is correlated to myocardial necrosis and most commonly associated with acute coronary syndrome, however it can also be elevated in heart failure, tachyarrhythmias and other conditions such as sepsis, therefore its interpretation must be taken in context. The presence of pleuritic pain also suggests a respiratory or musculoskeletal cause.

B	Unstable angina

In patients with ischaemic pain but without a rise in cardiac biomarkers, the diagnosis of unstable angina may be made. Usually a history of previous stable angina and in the presence of cardiovascular risk factors intimates at this diagnosis. The clinical history suggests a non-cardiac origin for the pain.

C	Stable angina

Typical angina exhibits a constricting discomfort in the front of the chest, precipitated by exertion, relieved by rest or GTN and often involves a crescendo of pain. A pleuritic pain which reaches maximal intensity fast is more likely to be a respiratory or neuromuscular cause.

D	STEMI

Diagnosis is made with typical acute chest pain and persistent ST-elevation on the ECG, representing an epicardial coronary occlusion.

E	N-STEMI

Acute chest pain but without ST-elevation on ECG. ECG changes may include ST-depression, T-wave inversion or T-wave abnormalities. A rise in cardiac biomarkers with the above presentation indicates a N-STEMI diagnosis.

6556

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Session Progress

Responses Correct:	9
Responses Incorrect:	23
Responses Total:	32
Responses - % Correct:	28%

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A 54-year-old man, who has received tissue plasminogen activator (TPA) for an anterior myocardial infarction (MI), develops sudden dyspnoea and left ventricular failure 5 days later. On examination systolic murmur is heard loudest at the left sternal edge. Echocardiography with colour flow Doppler reveals a left to right shunt.

What is the diagnosis?

A	Ventricular septal defect (VSD)
B	Mitral regurgitation
C	Atrial septal defect
D	Aortic regurgitation
E	Aortic dissection

6557

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Calculator

Normal Values

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A 54-year-old man, who has received tissue plasminogen activator (TPA) for an anterior myocardial infarction (MI), develops sudden dyspnoea and left ventricular failure 5 days later. On examination systolic murmur is heard loudest at the left sternal edge. Echocardiography with colour flow Doppler reveals a left to right shunt.

What is the diagnosis?

A	Ventricular septal defect (VSD)
B	Mitral regurgitation
C	Atrial septal defect
D	Aortic regurgitation
E	Aortic dissection

Explanation

A	Ventricular septal defect (VSD)

VSD is classically seen 5–10 days after MI. Patients present with rapid deterioration, pulmonary oedema and hypotension. There is a harsh pansystolic murmur loudest at the left sternal edge. Diagnosis is usually made with the aid of colour flow Doppler. Inotropes are used to manage severe hypotension; cautious vasodilator therapy may be employed if the systolic blood pressure is above 100 mmHg. If patients remain unstable, intra-aortic balloon pump may be considered. Surgical or specialist cardiological opinion should be requested with reference to formal surgical closure or catheter placement of an umbrella device.

B	Mitral regurgitation

Mitral regurgitation can occur due to papilllary muscle damage as a complication of an MI. The murmur is typically pansystolic and best heard at the cardiac apex, with radiation to the axillae.

C	Atrial septal defect

Atrial septal defects can present as a chronic left to right shunt which results in right ventricular volume overload. It is not commonly associated with acute myocardial infarction, therefore the patient's presentation and heart sounds are consistent with an acute ventricular septal defect (VSD) secondary to ischaemia.

D	Aortic regurgitation

Aortic regurgitation is not a typical complication of an acute MI. An aortic regurgitation murmur may be described as an early systolic murmur, loudest at the right sternal edge, second intercostal space and accentuated by leaning the patient forward in held expiration.

E	Aortic dissection

Aortic dissections present classically as acute central chest pain radiating to the back, described as a sharp, tearing or ripping pain. Patients exhibit acute cardiac decompensation and shock. An aortic regurgitation murmur may be detected depending upon the type of dissection.

6557

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Session Progress

Responses Correct:	9
Responses Incorrect:	24
Responses Total:	33
Responses - % Correct:	27%

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A 53-year-old salesman who was previously fit and well developed prolonged and convincing chest pain playing squash. He is seen in A&E about 6 hours later. Investigation showed T-wave inversion in the inferior leads, creatine kinase (CK) approximately 500 U/l, troponin T level is 0.16 (elevated).

Which of the following represents the most likely diagnosis?

A	Non-cardiac chest pain
B	Unstable angina
C	Stable angina
D	STEMI
E	NSTEMI

6558

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Calculator

Normal Values

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A 53-year-old salesman who was previously fit and well developed prolonged and convincing chest pain playing squash. He is seen in A&E about 6 hours later. Investigation showed T-wave inversion in the inferior leads, creatine kinase (CK) approximately 500 U/l, troponin T level is 0.16 (elevated).

Which of the following represents the most likely diagnosis?

A	Non-cardiac chest pain
B	Unstable angina
C	Stable angina
D	STEMI
E	NSTEMI

Explanation

E NSTEMI

Given the inferior ECG changes and the raised troponin at 6 hours, the likely diagnosis is NSTEMI. Management include dual-antiplatelet therapy, appropriate secondary prevention, bed rest, analgesia and continuous ECG monitoring. He would be a candidate for inpatient angiography as his is at a high risk of future cardiovascular events (the GRACE score may be calculated to support this decision).

A Non-cardiac chest pain

Given the significant ECG changes and troponin rise, the diagnosis is NSTEMI. Were the investigations to be negative and the pain atypical for cardiac pain, then non-cardiac chest pain may be suspected.

B Unstable angina

The diagnosis of unstable angina relies upon a clinical history of ischaemic pain but without a rise in cardiac biomarkers. Here the troponin is significantly elevated indicating a NSTEMI cause in conjunction with the ECG changes.

C Stable angina

Typical angina chest pain is short-lived, relieved by rest or GTN usually within 5 minutes. The pain usually involves a build-up or crescendo, with troponin levels negative. This patient may have experienced exertional chest pain typical of angina prior to his presentation of NSTEMI in the scenario.

D STEMI

Diagnosis is made with typical acute chest pain and persistent ST-elevation on the ECG, representing an epicardial coronary occlusion. T-wave inversion indicated NSTEMI as the more likely diagnosis especially in the context of a troponin rise.

6558

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Session Progress

Responses Correct:	9
Responses Incorrect:	25
Responses Total:	34
Responses - % Correct:	26%

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You are working as an expedition doctor on a climbing trip to the Andes. A 38-year-old man is brought down rapidly from the mountain to base camp. On arrival at the medical tent he is on 40% oxygen but has obvious pulmonary oedema and is distressed, his saturations are still only 90%.

Which of the following agents represents the next most appropriate intervention for this man?

A	Furosemide IV
B	Hydrocortisone IV
C	Nifedipine
D	Acetazolamide
E	High concentration O_2

6559

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Calculator

Normal Values

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A	Furosemide IV
B	Hydrocortisone IV
C	Nifedipine
D	Acetazolamide
E	High concentration O_2

Explanation

E	High concentration O_2

This man has acute mountain sickness, one manifestation of which is acute pulmonary oedema. Nifedipine reduces pulmonary hypertension and is the treatment of choice for pulmonary oedema in cases where high-flow oxygen is not available. In this case, however, it is, so oxygen would be initiated first, particularly in view of persistent hypoxia on 40% O_2.

A	Furosemide IV

Given the pathophysiology of acute mountain sickness due to the exposure to a low partial pressure of oxygen at high altitude, furosemide IV is not the correct choice. The main treatment is to descend from altitude.

B	Hydrocortisone IV

In acute mountain sickness, patients may also present with high-altitude cerebral oedema, the treatment for which is dexamethasone.

C	Nifedipine

If high-flow oxygen is not available, then nifedipine can be used as second line. It reduces pulmonary hypertension and therefore is an appropriate choice for pulmonary oedema in the context of acute mountain sickness.

D	Acetazolamide

Acetazolamide may be of some value in prophylaxis in preventing acute mountain sickness, but the best prevention is slow acclimatisation.

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Difficulty: Average

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Session Progress

Responses Correct:	9
Responses Incorrect:	26
Responses Total:	35
Responses - % Correct:	26%

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A 65-year-old lady presents with a history of collapse, the latest of which has occurred at the supermarket. There is a history of paroxysmal atrial fibrillation and she takes sotalol for this. She is in sinus rhythm on admission to the Emergency Department. Echocardiography reveals an ejection fraction of 30%. Outpatient 24-hour tape later reveals two episodes of complete heart block during sleep, one with a pause lasting for 5 seconds.

Which of the following represents the most appropriate management for this patient?

A	Stop sotalol
B	Stop sotalol and commence digoxin therapy
C	Arrange for insertion of single-chamber pacemaker
D	Arrange for dual-chamber pacing
E	Commence midodrine therapy

6560

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Calculator

Normal Values

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A 65-year-old lady presents with a history of collapse, the latest of which has occurred at the supermarket. There is a history of paroxysmal atrial fibrillation and she takes sotalol for this. She is in sinus rhythm on admission to the Emergency Department. Echocardiography reveals an ejection fraction of 30%. Outpatient 24-hour tape later reveals two episodes of complete heart block during sleep, one with a pause lasting for 5 seconds.

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C	Arrange for insertion of single-chamber pacemaker
D	Arrange for dual-chamber pacing
E	Commence midodrine therapy

Explanation

D Arrange for dual-chamber pacing

This woman has a history of paroxysmal atrial fibrillation and now has a documented pause and complete heart block on her electrocardiogram (ECG); additionally the ejection fraction points towards impairment of LV function. Management of choice in this case is dual-chamber pacing. The most likely cause is sick sinus syndrome, due to idiopathic fibrosis of the sinus node.

A Stop sotalol

For the patient with documented pauses and paroxysmal atrial fibrillation, insertion of a permanent pacemaker is the definitive management. While stopping the sotalol alone may improve bradycardiac episodes, there is a risk of further episodes of paroxysmal atrial fibrillation.

B Stop sotalol and commence digoxin therapy

Stopping the sotalol and replacing it with another rate-limiting medication would not address the presence of pauses and sick sinus syndrome. Insertion of a pacemaker, with adequate β-blocker therapy afterwards to prevent tachyarrhythmias, is the most appropriate management.

C Arrange for insertion of single-chamber pacemaker

While permanent pacing is the correct management option, a dual-chamber pacemaker would be preferred due to the presence of predominantly sinus rhythm. Single-chamber pacemakers are utilised for patients in permanent atrial fibrillation.

E Commence midodrine therapy

Midodrine is indicated for treatment of orthostatic hypotension. The patient is presenting with sick sinus syndrome, due to idiopathic fibrosis of the sinus node, an electrical rather than vascular problem.

6560

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Responses Correct:	9
Responses Incorrect:	27
Responses Total:	36
Responses - % Correct:	25%

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A 23-year-old man is admitted as an emergency from a nightclub. He presents with new-onset atrial fibrillation (AF) with a ventricular rate of 130 bpm. His systolic blood pressure is only 95 mmHg and he is electrically cardioverted. His sinus rhythm electrocardiogram (ECG) shows a PR interval of 100 milliseconds and a slurred onset of the QRS complex (delta wave).

What is the long-term treatment of choice in this patient?

A	Digoxin
B	Amiodarone
C	Sotalol
D	Radiofrequency ablation of the accessory pathway
E	Cardioversion for symptomatic arrhythmias in the future

6561

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Calculator

Normal Values

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A 28-year-old man presents for follow up after two episodes of collapse. The Cardiology Clinic arranged a 24-hour tape which reveals one episode of nocturnal paroxysmal atrial fibrillation with a maximal ventricular rate of 145 bpm. PR interval is 140 milliseconds and the QT interval is normal. Echocardiography is unremarkable. Thyroid function testing is unremarkable.

Which of the following treatments is most appropriate in this case?

A	Bisoprolol
B	Disapyramide
C	Amiodarone
D	Digoxin
E	Diltiazem

6562

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Calculator

Normal Values

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A	Bisoprolol
B	Disapyramide
C	Amiodarone
D	Digoxin
E	Diltiazem

Explanation

A	Bisoprolol

Bisoprolol is recommended as initial prophylaxis against further episodes of paroxysmal atrial fibrillation by both NICE and the European Society of Cardiology. Many patients do not however want to commit to long-term therapy, and for this reason electrophysiological studies coupled with possible ablation is an increasingly popular option. This can be used in combination with Class Ic agents, eg propafenone or flecainide, to control ventricular rates if atrial fibrillation evolves into atrial flutter.

B	Disapyramide

Disopyramide is an anti-arrhythmic medication used for treatment of ventricular tachycardia due to its Class Ia properties.

C	Amiodarone

This is useful in acute management; however, due to its side-effects from long-term use, amiodarone is not the most appropriate choice.

D	Digoxin

Digoxin is pro-fibrillatory and therefore should not be used in paroxysmal atrial fibrillation or if DC cardioversion is planned.

E	Diltiazem

Beta-blockers are generally considered first line; however diltiazem can be used if there is no evidence of structural heart disease on echocardiogram or if patients have severe asthma.

6562

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Difficulty: Average

Peer Responses %

Session Progress

Responses Correct:	9
Responses Incorrect:	29
Responses Total:	38
Responses - % Correct:	24%

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A 69-year-old woman is assessed in the Emergency Department after an episode of retrosternal chest pain while mopping her floors; the pain lasted for 30 minutes. She has a past history of rheumatic fever and hypertension but nil else of note. On examination she is obese with a BMI of 34, blood pressure is 147/82 mmHg, controlled with ramipril and bendroflumethiazide. Electrocardiogram (ECG) reveals broad P waves but nil else of note and chest X-ray reveals evidence of old tuberculosis.

What is the management of choice in this patient?

A	Admit for 12-hour highly sensitive troponin T test
B	Admit for 3-hour highly sensitive troponin T test
C	Discharge
D	Commence IV heparin
E	Commence IV IIB IIIA antagonist therapy

6563

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Calculator

Normal Values

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A 69-year-old woman is assessed in the Emergency Department after an episode of retrosternal chest pain while mopping her floors; the pain lasted for 30 minutes. She has a past history of rheumatic fever and hypertension but nil else of note. On examination she is obese with a BMI of 34, blood pressure is 147/82 mmHg, controlled with ramipril and bendroflumethiazide. Electrocardiogram (ECG) reveals broad P waves but nil else of note and chest X-ray reveals evidence of old tuberculosis.

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A	Admit for 12-hour highly sensitive troponin T test
B	Admit for 3-hour highly sensitive troponin T test
C	Discharge
D	Commence IV heparin
E	Commence IV IIB IIIA antagonist therapy

Explanation

B	Admit for 3-hour highly sensitive troponin T test

This patient has at least two risk factors for cardiac chest pain: obesity and hypertension. As such she should be screened for cardiac chest pain. A high-sensitivity troponin at 3 and 6 hours is sufficient to determine the presence of an ischaemic event with myocardial damage.

A	Admit for 12-hour highly sensitive troponin T test

Modern practice with high-sensitivity troponin now dictates that troponin assay at 3 and 6 hours is adequate to determine whether myocardial damage has occurred.

C	Discharge

The patient has presented with 30 minutes of cardiac-sounding chest pain and therefore warrants further investigation. With serial ECGs unremarkable, troponin assays are required to exclude myocardial ischaemia, and therefore discharge would not be appropriate.

D	Commence IV heparin

IV heparin use has largely been superseded by low molecular weight heparin and factor Xa inhibitors such as fondaparinux, due to practicalities of administration and the narrow therapeutic window (APTT) required with IV heparin.

E	Commence IV IIB IIIA antagonist therapy

IIB IIIA receptor antagonist therapy would not be indicated unless significant ECG changes occurred or there was the presence of elevated troponins. Its use is predominantly in 'upstream' management of acute coronary syndromes or as an adjunct during percutaneous coronary intervention. IIB IIIA receptor antagonists are usually combined with a suitable anticoagulant.

6563

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Difficulty: Easy

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Session Progress

Responses Correct:	9
Responses Incorrect:	30
Responses Total:	39
Responses - % Correct:	23%

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You are asked to urgently review a 56-year-old man who has 'gone off' on the cardiology ward. He is 4 days post-myocardial infarction. His blood pressure is 100/50, similar in both arms and his pulse is 100. On examination he has a systolic murmur loudest at the apex and there is evidence of left ventricular failure.

What diagnosis fits best with this clinical picture?

A	Ventricular septal defect
B	Mitral regurgitation
C	Aortic dissection
D	Aortic regurgitation
E	Atrial septal defect

6564

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Calculator

Normal Values

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What diagnosis fits best with this clinical picture?

A	Ventricular septal defect
B	Mitral regurgitation
C	Aortic dissection
D	Aortic regurgitation
E	Atrial septal defect

Explanation

Acute mitral regurgitation may occur post myocardial infarction (MI) due to ruptured chordae tendonae. Patients present with hypotension, tachycardia and left ventricular failure and with a systolic murmur. If blood pressure allows, patients benefit from volume reduction using diuretics and initiation of angiotensin-converting enzyme (ACE) inhibitor therapy. Surgical repair in post-MI patients carries high operative risk.

6564

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Session Progress

Responses Correct:	9
Responses Incorrect:	31
Responses Total:	40
Responses - % Correct:	23%

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You review a 48-year-old African–Caribbean man with hypertension. He has visited the clinic on three occasions and his blood pressure has averaged 155/85 mmHg. Despite lifestyle measures, he remains hypertensive.

Which of the following agents would be the most appropriate initial therapy for him?

A	Amlodipine
B	Ramipril
C	Losartan
D	Atenolol
E	Metoprolol

6579

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Calculator

Normal Values

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You review a 48-year-old African–Caribbean man with hypertension. He has visited the clinic on three occasions and his blood pressure has averaged 155/85 mmHg. Despite lifestyle measures, he remains hypertensive.

Which of the following agents would be the most appropriate initial therapy for him?

A	Amlodipine
B	Ramipril
C	Losartan
D	Atenolol
E	Metoprolol

Explanation

Recently updated guidelines on blood pressure tend to recommend starting therapy with either an ACE inhibitor or calcium antagonist, with calcium antagonists probably more effective as initial therapy in afro-caribbean patients due to racial differences in renin levels. An ACE inhibitor or diuretic may then be added to the calcium antagonist. Beta-blockers have fallen out of favour a little, and the beta-blocker diuretic combo is not recommended due to an association with incident diabetes in BP lowering meta-analyses.

6579

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Difficulty: Average

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Session Progress

Responses Correct:	9
Responses Incorrect:	32
Responses Total:	41
Responses - % Correct:	22%

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You review a 61-year-old man with type-2 diabetes mellitus who has recently moved to the area. He is known with hypertension and currently takes ramipril 10 mg and amlodipine 10 mg. His blood pressure is 155/80 mmHg in the clinic and he has documented microalbuminuria.

Which of the following would be an appropriate blood pressure target for this patient?

A	145/85 mmHg
B	130/80 mmHg
C	140/90 mmHg
D	135/85 mmHg
E	150/80 mmHg

6580

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Calculator

Normal Values

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You review a 61-year-old man with type-2 diabetes mellitus who has recently moved to the area. He is known with hypertension and currently takes ramipril 10 mg and amlodipine 10 mg. His blood pressure is 155/80 mmHg in the clinic and he has documented microalbuminuria.

Which of the following would be an appropriate blood pressure target for this patient?

A	145/85 mmHg
B	130/80 mmHg
C	140/90 mmHg
D	135/85 mmHg
E	150/80 mmHg

Explanation

A lower target for blood pressure is recommended in patients with diabetes mellitus who have a history of renal or cardiovascular disease of 130/80 mmHg (NICE guidelines). Regular review is also supported, with re-enforcement of lifestyle advice, including weight reduction, being seen as a key feature of good care. Statins are also recommended for most patients with Type 2 diabetes above 40 years of age according to JBS guidelines. The only group they are not recommended for is those patients who have no significant increase in cardiovascular risk.

6580

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A 28-year-old man attends casualty after collapsing at the local swimming pool. He reports the last thing he remembers is getting out of the pool. A lifeguard said he felt 'a very rapid pulse' immediately after the event. On examination in emergency he is beginning to rouse, he is in sinus rhythm, and QTc (corrected QT interval) on the electrocardiogram is around 0.5 s. On further questioning, it appears he was brought up by his aunt and uncle, as his father died suddenly when the patient was a small child.

What is the most likely cause of his collapse?

A	A JLN1 mutation
B	A JLN2 mutation
C	An LQT1 mutation
D	An LQT2 mutation
E	An LQT3 mutation

6581

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A 28-year-old man attends casualty after collapsing at the local swimming pool. He reports the last thing he remembers is getting out of the pool. A lifeguard said he felt 'a very rapid pulse' immediately after the event. On examination in emergency he is beginning to rouse, he is in sinus rhythm, and QTc (corrected QT interval) on the electrocardiogram is around 0.5 s. On further questioning, it appears he was brought up by his aunt and uncle, as his father died suddenly when the patient was a small child.

What is the most likely cause of his collapse?

A	A JLN1 mutation
B	A JLN2 mutation
C	An LQT1 mutation
D	An LQT2 mutation
E	An LQT3 mutation

Explanation

Six mutations (LQT1–6) have been identified in association with the Romano–Ward syndrome.

LQT1 and LQT2 mutations make up around 87% of cases of Romano–Ward syndrome and are associated with cardiac potassium-channel gene mutations.

JLN mutations (Jervell–Lange-Nielsen syndrome) tend to be associated with deafness. Although sudden death usually occurs in symptomatic patients, it happens with the first episode of syncope in about 30% of the patients. This occurrence emphasizes the importance of diagnosing LQTS in the presymptomatic period. Depending on the type of mutation present, sudden cardiac death may happen during exercise, emotional stress, at rest, or at sleep.

LQT4 is associated with paroxysmal atrial fibrillation. Studies have shown an improved response to pharmacologic treatment with a lowered rate of sudden cardiac death in LQT1 and LQT2 compared with LQT3.Triggering events are somewhat different by genotype. Patients with LQT1 usually have cardiac events preceded by exercise or swimming. Sudden exposure of the patient's face to cold water is thought to elicit a vagotonic reflex.

Patients with LQT2 may have arrhythmic events after an emotional event, exercise, or exposure to auditory stimuli (eg, door bells, telephone ring).

Patients with LQT3 usually have events during night sleep. Diagnosis is based upon the QTc (corrected QT interval), although this may be within the normal range at rest; hence, Holter monitoring is recommended. Genetic testing for known mutations in DNA samples from patients is becoming accessible in specialized centers.

Identification of an LQTS genetic mutation confirms the diagnosis. However, a negative result on genetic testing is of limited diagnostic value because only approximately 50% of patients with LQTS have known mutations. The remaining half of patients with LQTS may have mutations of yet unknown genes. Therefore, genetic testing has high specificity but a low sensitivity. Beta-blockade is seen as the treatment of choice for most cases of long QT syndrome, which is thought to work through reducing adrenergic demand. Implantable defibrillators are also used in the management of these patients.

6581

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Responses Incorrect:	34
Responses Total:	43
Responses - % Correct:	21%

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A 70-year-old man presents to the A&E department having been urgently referred by his GP with a history of transient weakness of the right arm and leg. This had an onset shortly after waking the previous day and had resolved by night-time. He admits to having had a similar episode a couple of weeks earlier but for which he had sought no medical opinion. He is a known hypertensive on medication, but his blood pressure has been well controlled. He is a non-smoker. On the basis of the examination and routine investigations, the duty surgical registrar arranges an urgent carotid Doppler ultrasound scan. The result says, "good proximal flow in both common carotids, 85% stenosis right internal carotid artery, 90% stenosis left internal carotid artery.

Which of the following is likely to fit best as the most likely vascular lesion in this patient?

A	Left common carotid stenosis
B	Left internal carotid stenosis
C	Right common carotid stenosis
D	Left vertebral artery stenosis
E	Right vertebral artery stenosis

6816

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Normal Values

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A 70-year-old man presents to the A&E department having been urgently referred by his GP with a history of transient weakness of the right arm and leg. This had an onset shortly after waking the previous day and had resolved by night-time. He admits to having had a similar episode a couple of weeks earlier but for which he had sought no medical opinion. He is a known hypertensive on medication, but his blood pressure has been well controlled. He is a non-smoker. On the basis of the examination and routine investigations, the duty surgical registrar arranges an urgent carotid Doppler ultrasound scan. The result says, "good proximal flow in both common carotids, 85% stenosis right internal carotid artery, 90% stenosis left internal carotid artery.

Which of the following is likely to fit best as the most likely vascular lesion in this patient?

A	Left common carotid stenosis
B	Left internal carotid stenosis
C	Right common carotid stenosis
D	Left vertebral artery stenosis
E	Right vertebral artery stenosis

Explanation

A transient ischaemic attack (TIA) results from a brief interruption of blood flow to the brain with the symptoms produced from this blockage having an effect that lasts less than 24 hours. A TIA is a warning sign of a future stroke. Internal carotid stenosis occlusion syndrome manifests with transient hemiplegia, persistent hemiparesis and a unilateral loss of vision with involvement of the ophthalmic artery. The risk factors for carotid artery disease are similar to those for coronary artery disease. Medical treatment is appropriate for mild to moderate carotid stenosis and is aimed at risk factor modification. The treatment for a symptomatic significant carotid stenosis is surgical.

6816

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Responses Incorrect:	35
Responses Total:	44
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A 29-year-old man of no fixed abode is brought to the casualty department with 4-week history of haemoptysis, cough and shortness of breath. He denies any other medical problems but he is a known smoker of a pack a day and it is evident that he likes his alcohol but he does not admit to how much he drinks. He is sketchy about other details of his life but does admit to living on the streets since his late teens. The positive findings on clinical examination include tachycardia and tachypnoea, an increased JVP, ascites, hepatomegaly, peripheral oedema and decreased heart sounds. The ECG obtained from the patient is of low voltage and shows QRS complexes of alternating amplitude.

In this patient, which of the following diagnosis would be the LEAST likely cause of this ECG appearance?

A	Infective endocarditis
B	Mesothelioma
C	Tuberculosis
D	HIV
E	Carcinoma of the lung

6817

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Normal Values

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B	Mesothelioma
C	Tuberculosis
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E	Carcinoma of the lung

Explanation

The ECG appearances are compatible with a pericardial effusion and the answer to this question lies in the causes of a pericardial effusion. Causes of a pericardial effusion include neoplastic, infectious (including tuberculosis and HIV), valvular disease (as may result from infective endocarditis), trauma, uraemia and myxoedema. Classical findings on an ECG include low voltage, sinus tachycardia and electrical alternans. However, for non-invasive diagnosis, an echocardiogram is the criterion standard. Mesothelioma is a tumour of mesothelial cells that may be found in the pleura, pericardium and peritoneum. Asbestos exposure is the most significant risk factor. Malignant mesothelioma has a peak incidence 35–45 years after asbestos exposure.

6817

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Responses Correct:	9
Responses Incorrect:	36
Responses Total:	45
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One week after a 71-year-old female patient presented with an acute myocardial infarction requiring thrombolysis, a routine ECG is performed. The patient complains of no significant problems, but on questioning of the nurses, it is reported that she has been troubled by dizziness and almost passed out in the hospital bathroom. The clinical examination findings are in concordance with the ECG findings, which shows a Mobitz type II block and an old anterior myocardial infarction.

What would be the best management strategy in this patient?

A	Adrenaline (epinephrine)
B	Atropine
C	Temporary pacing on the ward
D	Inpatient referral for permanent pacing
E	Amiodarone

6818

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B	Atropine
C	Temporary pacing on the ward
D	Inpatient referral for permanent pacing
E	Amiodarone

Explanation

Second degree heart block results from a defect in the conduction system of the heart whereby some P waves fail to conduct to the ventricle and generate a QRS complex. There are two types of second degree heart block: Mobitz type I (Wenckebach phenomenon), which is characterised by progressive prolongation of the PR interval until a P wave fails to conduct to the ventricle, and Mobitz type II, which is characterised by an intermittent failure of the P wave to stimulate a QRS complex at regular intervals — the PR interval is constant. Atropine may be used in selected cases of transient AV block (bradycardia with symptoms as per the acute life support guidelines*), but in general permanent cardiac pacing has replaced medical interventions where the patient is symptomatic with their AV block.

https://www.resus.org.uk/resuscitation-guidelines/

6818

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Responses Correct:	9
Responses Incorrect:	37
Responses Total:	46
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A 68-year-old man with a history of ankylosing spondylitis is referred to the cardiology department following the discovery of a diastolic murmur by the general practitioner (GP). He does not describe any chest pain or breathlessness but he has experienced some palpitations over the last six months.
His blood pressure is 175/95 mmHg with a heart rate of 100 beats/min at rest. Clinical examination reveals a collapsing pulse, cardiac apex displaced to the anterior axillary line and a diastolic murmur. The chest is clear on auscultation and there is no peripheral oedema.
Electrocardiogram (ECG) shows sinus rhythm with ventricular ectopics and left ventricular hypertrophy.
Chest X-ray shows cardiomegaly with clear lung fields.
An echocardiogram confirms the presence of aortic regurgitation with a dilated left ventricle (diastolic diameter > 70mm) and an ejection fraction of 50%.
A 24-h ECG shows sinus rhythm with frequent ventricular ectopics that correspond to the patient's experienced palpitations.

Which of the following is the long-term management of choice in this case?

A	Ramipril
B	Bisoprolol
C	Antibiotic prophylaxis advice
D	Annual echocardiographic follow-up
E	Referral to the cardiothoracic team for valve replacement

6908

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Explanation

Angiotensin-converting enzyme (ACE) inhibitors are part of the treatment regime in aortic regurgitation. However this patient, although relatively asymptomatic, needs to be considered for valve replacement given the echocardiographic findings of a dilated left ventricle, even though the ejection fraction is relatively preserved, the LV dilatation suggests rapid deterioration is a possibility. In the case of regurgitant murmurs, patients tend to be relatively asymptomatic till later on in the course of the disease, so regular echocardiographic follow-up is required to pick up individuals with early features of left ventricular failure that would benefit from valve replacement.

6908

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A 75-year-old lady presents to the emergency department complaining of chest pain. Her initial electrocardiogram (ECG) shows ST elevation in leads II, III and aVF. Thrombolytic therapy is initiated and the patient is admitted to the coronary care unit. One hour later the ECG shows a bradycardia of 50 beats/min with second-degree, (Mobitz type 1) -atrioventricular block and isoelectric ST segments. The patient is asymptomatic with a blood pressure of 105/62 mmHg.

What is the most appropriate course of action?

A	Continuous monitoring
B	Rescue angioplasty
C	Intravenous atropine
D	Temporary intravenous pacing
E	External pacing

6909

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C	Intravenous atropine
D	Temporary intravenous pacing
E	External pacing

Explanation

Atrioventricular (AV) block is commonly associated with inferior myocardial infarctions as the blood supply to the AV node arises from the right coronary artery, which is the culprit vessel in most cases of inferior MIs. It is thought to be of no prognostic significance in this case and usually resolves in the first 24 h. As the patient is haemodynamically stable and asymptomatic, she should continue to be monitored in the coronary care unit, but no immediate measures are required at this stage. In contrast AV blocks in the context of anterior MIs convey a poor prognosis as they signify an extensive event.

6909

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A 30-year-old lady who is 16 weeks pregnant presents to her general practitioner (GP) complaining of palpitations. A resting electrocardiogram (ECG) is reported as partial right bundle branch block (RBBB) with right axis deviation. Clinical examination reveals a heaving precordium with splitting of the first and second heart sound and no added murmurs.

What is the most likely diagnosis?

A	Mitral valve prolapse
B	Primary pulmonary hypertension
C	Ostium secundum atrial septal defect (ASD)
D	Ventricular septal defect
E	Ostium Primum ASD

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B	Primary pulmonary hypertension
C	Ostium secundum atrial septal defect (ASD)
D	Ventricular septal defect
E	Ostium Primum ASD

Explanation

Atrial Septal Defects make up 30% of congenital heart disease detected in the adult population. The female:male ratio is 2:1 and 75% of them are ostia secunda. They commonly present during pregnancy with either breathlessness or palpitations. There usually is no audible murmur with ASDs. The combination of right bundle branch block (RBBB) and right axis deviation on theelectrocardiogram (ECG) makes an ostium secundum ASD more likely. These patients should have urgent echocardiographic assessment to assess the state of the right heart and be followed up very closely as the prognosis is very poor if they develop Eisenmerger's syndrome; early surgical intervention after the birth of the child is a consideration.

6910

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A 30-year-old man is found to be hypertensive with a blood pressure of 165/95 mmHg during a routine work medical. On further examination by his general practitioner (GP) he is found to have a systolic murmur on auscultation. He is therefore referred for an echocardiogram that shows a hypertrophic left ventricle with a bicuspid aortic valve that is seen to open well with no significant pressure gradient across the valve.

Which of the following investigations is most likely to provide the clearest anatomical description of the underlying diagnosis?

A	24-h urinary cortisol
B	Urinary catecholamines
C	Renal ultrasound with Doppler
D	Magnetic resonance imaging (MRI) of the thorax
E	Plasma renin

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C	Renal ultrasound with Doppler
D	Magnetic resonance imaging (MRI) of the thorax
E	Plasma renin

Explanation

The answer is Magnetic resonance imaging (MRI) of the thorax -

The finding of hypertension and a systolic murmur in an otherwise asymptomatic young patient should always raise the possibility of aortic coarctation as the underlying diagnosis. This can be associated with a bicuspid aortic valve and should always be looked for in the presence of such a finding. A computerised tomography (CT) aortogram or an MRI of the chest can define the exact site of the lesion. The prognosis of the condition is better the earlier a repair procedure is undertaken. There is a 75% mortality by the age of 50 years if uncorrected.

6911

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A 28-year-old woman is referred to the cardiology clinic with exertional breathlessness, which has become progressively worse over the past year. There is no history of wheezing and she has had no benefit from a trial of salbutamol inhalers. On close questioning she describes intermittent episodes of chest pain on exertion. She has become very concerned as she almost fainted on a couple of occasions in the last month.

On examination she has a blood pressure of 135/85 mmHg with a heart rate of 90 beats/min. Her BMI is 22kg/m^2. The jugular venous pressure is raised, with giant v-waves and there is a left parasternal heave.
The electrocardiogram (ECG) shows sinus rhythm with right axis deviation.

Which of the following is the most likely diagnosis?

A	Chronic pulmonary emboli
B	Idiopathic pulmonary artery hypertension (IPAH)
C	Ischaemic heart disease
D	Loeffler syndrome
E	Hypertrophic cardiomyopathy (HCM)

6913

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A 28-year-old woman is referred to the cardiology clinic with exertional breathlessness, which has become progressively worse over the past year. There is no history of wheezing and she has had no benefit from a trial of salbutamol inhalers. On close questioning she describes intermittent episodes of chest pain on exertion. She has become very concerned as she almost fainted on a couple of occasions in the last month.

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E	Hypertrophic cardiomyopathy (HCM)

Explanation

B Idiopathic pulmonary artery hypertension (IPAH)

PPH is a rare condition characterised by elevated pulmonary artery pressure and without a clear cause. The above case describes a typical presentation for IPAH. IPAH was previously known as (and is often still called) primarily pulmonary hypertension (PPH). Syncope is seen in approximately 13% of patients. The ECG findings point towards right ventricular hypertrophy, which is an end result of this condition. Treatment is typically with calcium channel blockers and anticoagulation; nebulised prostacyclin can also be considered

A Chronic pulmonary emboli

Chronic emboli can lead to chronic pulmonary hypertension, which may present with similar features to those described above. However, no risk factors for venous thromboembolism are described. Additionally, there is no description of any DVT symptoms that would support this diagnosis

C Ischaemic heart disease

Intermittent chest pain on exertion may raise the suspicion of myocardial ischaemia. However, the patient is young and no significant risk factors for coronary artery disease have been described, making this diagnosis unlikely.

D Loeffler syndrome

Loffler syndrome is an eponymous term for acute onset pulmonary eosinophilia. Typically this condition occurs secondary to an external trigger (the syndrome was originally described in association with parasitic infection by *Ascaris lumbricoides*). There is no evidence to support an external trigger in this case. Wheeze is often a central feature.

E Hypertrophic cardiomyopathy (HCM)

This lady is presenting with significant breathlessness. Patients with HCM can present this way secondary to heart failure. However, her ECG shows no features to suggest significant left ventricular hypertrophy, which would be expected if HCM was the underlying diagnosis.

6913

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A 71-year-old man is referred to the rapid access clinic with exertional breathlessness over the last 2 months. A chest X-ray ordered by the general practitioner (GP) 3 weeks ago has been reported as consistent with a small degree of left ventricular failure. The GP has started the patient on furosemide 40 mg OD, with complete resolution of symptoms.

On examination the patient looks well, with a blood pressure of 135/85 mmHg and a heart rate of 65 beats/min. There is a loud ejection systolic murmur on auscultation of his heart that radiates to the carotids. The chest is clear on auscultation.

On close questioning he denies any pre-syncopal episodes or any angina. There is no history of rheumatic fever in childhood and no recent history of pyrexial illnesses or dental procedures.
The patient undergoes an echocardiogram that is reported as showing critical aortic stenosis with a valve area of 0.5 cm^2 and a pressure gradient of 120 mmHg. The left ventricle shows concentric hypertrophy, with mild impairment of function.

What is the most appropriate next step in the management?

A	Initiation of angiotensin-converting enzyme (ACE) inhibitor therapy in addition to the regular furosemide
B	Prophylactic antibiotic advice and arrangement for regular follow-up with repeat echocardiograms
C	Outpatient cardiothoracic referral
D	Urgent outpatient coronary angiogram
E	Admission to hospital for inpatient coronary angiogram and cardiothoracic opinion

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C	Outpatient cardiothoracic referral
D	Urgent outpatient coronary angiogram
E	Admission to hospital for inpatient coronary angiogram and cardiothoracic opinion

Explanation

E Admission to hospital for inpatient coronary angiogram and cardiothoracic opinion

The clinical state of this patient appears stable. However, the objective investigations reported in the vignette highlight that there is critical aortic stenosis associated with associated symptoms (exertional breathlessness). The risk of sudden death is high in such a patient, and he requires an urgent inpatient work-up for valve replacement.

A Initiation of angiotensin-converting enzyme (ACE) inhibitor therapy in addition to the regular furosemide

ACE inhibitors are generally considered contraindicated in aortic stenosis. This is due to concerns that the use of a vasodilator may reduce coronary perfusion pressure. As such, they are not a recommended treatment. Additionally, such pharmacologic management is insufficient for this degree of valve disease.

B Prophylactic antibiotic advice and arrangement for regular follow-up with repeat echocardiograms

Prophylactic antibiotics are not recommended for valvular lesions. There is no significant evidence to support a reduction in the rate of infective endocarditis when treated with prophylactic antibiotics. Regular follow-up is insufficient as this patient has critical aortic stenosis and needs urgent therapy.

C Outpatient cardiothoracic referral

Outpatient management is insufficient in this case due to the risk of acute deterioration and sudden death.

D Urgent outpatient coronary angiogram

Coronary angiography is required in the work-up of patients requiring a valve replacement. Assessment of the coronary arteries allows for planning of a combined CABG and valve replacement if necessary. However, outpatient management in this case is insufficient.

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Responses Total:	52
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A 27-year-old lady who has recently arrived to the UK from India is referred to the cardiology department because of intermittent palpitations associated with dizziness. She describes the palpitations as fast and irregular, with sudden onset and termination. She remembers a prolonged illness as a child but is unsure as to the nature of this. Additionally she reports that she suffers from asthma.

On examination she appears comfortable but underweight. Her pulse is 80 beats/min and regular, the jugular venous pressure is not raised and there is no peripheral oedema. There is a rumbling diastolic murmur over the apex on auscultation of the heart and the chest is clear.

An echocardiogram performed confirms the presence of rheumatic mitral stenosis. The patient is referred for a cardiothoracic opinion. Two weeks later, she attends the Emergency Department feeling extremely unwell. On arrival she is found to be in atrial fibrillation with a rate of 145 beats/min, a blood pressure of 110/70 mmHg and oxygen saturations of 95% on air. She is placed in the resuscitation area for closer monitoring.

Which of the following would be the best pharmacological intervention?

A	Intravenous esmolol
B	Oral digoxin
C	Intravenous amiodarone through a central line
D	Intravenous flecainide
E	DC Cardioversion

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Explanation

D Intravenous flecainide

This patient has a history of rheumatic heart disease with mitral stenosis and requires either rapid rate or rhythm control. Patients with mitral stenosis do poorly in atrial fibrillation. Flecainide would likely lead to pharmacological cardioversion to sinus rhythm. Concern exists about the use of flecainide in patients with 'structural heart disease'. This concern came about following the results of the CAST trial which examined the use of flecainide in the acute post-MI period. However, there is no significant evidence to suggest that rheumatic heart disease should contraindicate the use of this agent and it is used regularly in some institutions (see the reference below, and the weblinks at the foot of the case study).

The Cardiac Arrhythmia Suppression Trial Investigators: Preliminary report: Effect of encainide and flecainide on mortality in a randomized trial of arrhythmia suppression after myocardial infarction. *N Engl J Med* 1989;321(6):406-412.

A Intravenous esmolol

IV β-blockade would be appropriate in most patients, and here it would provide rapid rate control and would likely improve cardiac output. It would also be appropriate despite the low blood pressure (which is likely secondary to rate-related reduced cardiac output). However, the patient reports a history of asthma, which is a relative contraindication to the use of a β-blocker in this setting.

B Oral digoxin

Oral digoxin has a slow onset of action and will likely take several hours to have a significant effect in this patient.

C Intravenous amiodarone through a central line

Amiodarone is a class III antiarrhythmic agent. Although it would be a potentially suitable agent in this situation, implantation of a central line into an acutely decompensated and hypoxic patient is not without risks. It is likely that it will take significantly longer to insert a central line and administer the amiodarone than other available options.

E DC Cardioversion

This patient requires rapid rate or rhythm control to improve cardiac output. DC cardioversion may well be required if the patient deteriorates further. However, currently she is stable with no features of myocardial ischaemia, heart failure, syncope or hypoperfusion. As such, alternative treatment options should be considered initially.

6915

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Responses Total:	53
Responses - % Correct:	17%

External Links

- **Approach to Management of Atrial Fibrillation in the Indian Scenario**
  japi.org/april2007/suppliment/Suppliment_30-32.pdf
- **What Is Structural Heart Disease?**
  onlinelibrary.wiley.com/doi/10.1002/clc.4960230603/pdf
- **Preliminary Report: Effect of Encainide and Flecainide on Mortality in a Rand...**
  nejm.org/doi/full/10.1056/NEJM198908103210629

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A 68-year-old lady is referred to the cardiology department with intermittent palpitations. She describes episodes of 'feeling flushed' associated with a fluttering feeling in the chest. She denies any chest pain or breathlessness. There are no risk factors for ischaemic heart disease or any history or rheumatic fever. She is also suffering from paroxysms of diarrhoea.

On examination she appears well in herself. There are prominent v-waves noted on inspection of the jugular venous pulse. A pansystolic murmur is audible at the left sternal edge. The chest is clear on auscultation. A pulsatile liver is felt 2 cm below the costal margin on palpation of the abdomen.

Which of the following investigations is most likely to yield the underlying diagnosis?

A	24 h urine collection for 5-hydroxyindoleacetic acid (5-HIAA)
B	Echocardiogram
C	24 h electrocardiogram (ECG)
D	Chest X-ray
E	Abdominal ultrasound

6916

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E	Abdominal ultrasound

Explanation

A	24 h urine collection for 5-hydroxyindoleacetic acid (5-HIAA)

This patient presents with features of carcinoid syndrome. This is a paraneoplastic syndrome secondary to a carcinoid tumour. The most common locations for a carcinoid tumour are in gut and arise from the enterochromaffin cells. Carcinoid tumours secrete serotonin, which is metabolised by the liver. If the carcinoid tumour metastasises to the liver, serotonin enters the systemic circulation. Release of circulation is associated with flushing, diarrhoea and bronchoconstriction. Continued serotonin exposure can result in restrictive cardiomyopathy secondary to fibrosis. This can lead to valvular pathology (in this case the tricuspid valve). 5-HIAA is a degradation product of serotonin, which is excreted in the urine. A level of >25 mg per 24 is diagnostic.

B	Echocardiogram

This patient likely has tricuspid regurgitation secondary to the restrictive cardiomyopathy seen in 50% of cases of serotonin syndrome. The echocardiogram would likely demonstrate these cardiac abnormalities. However, it is not the investigation of choice to reveal the underlying cause.

C	24 h electrocardiogram (ECG)

Although this patient reports symptoms suggestive of palpitations ('fluttering feeling in the chest'), there are no features suggestive of a sinister arrhythmic event. This patient likely has carcinoid syndrome, which does not commonly affect cardiac conduction.

D	Chest X-ray

Carcinoid syndrome can occur secondary to a carcinoid tumour in the lungs (a common extra-GI site for primary carcinoid tumours). However, the features supporting tricuspid regurgitation point towards a liver metastasis as the serotonin source. A chest X-ray in this patient may only show non-specific changes or appear normal.

E	Abdominal ultrasound

This patient has an enlarged liver on clinical examination. This may be due to hepatic metastatic spread of a GI carcinoid tumour or secondary to the apparent tricuspid regurgitation. An abdominal ultrasound may show a hepatic tumour, but it is unlikely to be able to differentiate between a carcinoid tumour and a metastatic adenocarcinoma. Although it is an important investigation, it is unlikely to be the key to the underlying diagnosis.

6916

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Responses Incorrect:	45
Responses Total:	54
Responses - % Correct:	17%

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A 19-year-old man presents to the Emergency Department of a small district general hospital in the early hours of the morning, complaining of severe epigastric and retrosternal pain. He gives a history of a pyrexial illness over the preceding few days, which he thought was 'the flu'. He has not been able to sleep as he finds lying down extremely uncomfortable.

On examination he is pyrexial at 38°C, with a blood pressure of 135/85 mmHg and a heart rate of 90 beats/min. Saturations are 100% on room air. There is a friction rub heard over the precordium and the chest is clear on auscultation.

Investigations:

Hb	13.1 g/dl
WCC	11.6 × 10^9/l
PLT	253 × 10^9/l
Na^+	138 mmol/l
K^+	4.7 mmol/l
Creatinine	79 mol/l
Urea	4.0 mmol/l
ESR	60 mm/h
CK	250 U/l (25–195 U/l)

His electrocardiogram (ECG) shows widespread ST elevation.

Which of the following would be the most appropriate next step in this patient's care?

A	Ibuprofen 800 mg
B	Thrombolytic therapy with tissue plasminogen activator
C	Blood cultures and intravenous blind antibiotic treatment pending results
D	Urgent referral to the on-call cardiologist for echocardiogram
E	Urgent computerised tomography (CT) pulmonary angiogram

6918

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Explanation

A	Ibuprofen 800 mg

The clinical features presented here are suggestive of pericarditis, which often occurs with an antecedent viral illness. The pain is reported as positional, and auscultation reveals a pericardial rub (often described as the sound of walking on fresh snow). Ibuprofen is the first-line therapy for pericarditis and acts to reduce the pericardial inflammation.

B	Thrombolytic therapy with tissue plasminogen activator

The widespread ECG changes may initially raise a concern of ischaemic heart disease. However, the young age and the fact that the ST-segment changes are not limited to a specific coronary artery territory point away from this diagnosis.

C	Blood cultures and intravenous blind antibiotic treatment pending results

The clinical picture of fever with a raised white cell count should always raise the suspicion of developing sepsis in this patient. However, the remainder of the clinical picture does not support profound sepsis and highlights pericarditis as a likely diagnosis. The majority of pericarditis in the UK is caused by a viral infection and, as such, antibiotics will not alter the disease progression.

D	Urgent referral to the on-call cardiologist for echocardiogram

This patient does not have significant features of myocarditis (which can develop in conjunction with pericarditis); however, a troponin level would elucidate this further. If myocarditis were suspected then an echocardiogram may be required prior to a cardiac MRI (the definitive imaging modality of myocarditis). However, this imaging is not required urgently and is unlikely to alter acute management.

E	Urgent computerised tomography (CT) pulmonary angiogram

The chest pain presented here is not typical for a pulmonary embolism (PE), which should be pleuritic in nature. Furthermore, there are significant features pointing away from the diagnosis of a PE. As such, an acute CTPA is unnecessary at this time.

6918

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Responses Total:	55
Responses - % Correct:	16%

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A 73-year-old male presents to the Emergency Department complaining of central chest and back pain. This has started suddenly 2 hours ago and is getting progressively worse. He has a past medical history of hypertension, for which he is on bendroflumathiazide and perindopril. He denies any history of angina in the past.

On examination his blood pressure is 90/30 mmHg and his heart rate is 120 beats/min. There is an early diastolic murmur on auscultation of his heart and reduced air entry in the bases of his lungs bilaterally. He appears not to be moving the left side of his body.

An electrocardiogram (ECG) performed in the resuscitation area shows ST elevation in leads II, III and aVF.

A chest X-ray shows an enlarged heart with a small, left-sided pleural effusion.

Which of the following would be the most appropriate next step in the management?

A	Initiation of thrombolytic therapy with streptokinase
B	Fluid resuscitation and admission to the coronary care unit
C	Urgent computerised tomography of the chest with contrast
D	Bedside echocardiogram and urgent cardiothoracic review
E	Urgent cardiology referral for primary revascularisation

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Explanation

D	Bedside echocardiogram and urgent cardiothoracic review

This patient presents with features suggestive of aortic dissection. In particular, the history of chest pain radiating to the back is concerning. The presence of an early diastolic murmur suggests aortic valve regurgitation. The ECG changes are in the inferior territory and indicate occlusion of the right coronary artery. These two features combined suggest that the dissection has tracked back to the heart itself. The enlarged heart on chest X-ray may suggest a haemopericardium, and the patient should be assessed for cardiac tamponade given his low blood pressure. This patient is highly unstable and requires urgent cardiothoracic involvement if he is to survive. Although a CT would be the gold standard investigation, he is too unstable to be moved. An echocardiogram is likely to visualise some aspect of the dissection in this instance due to the cardiac involvement. Additionally, it will be able to assess cardiac function and assess for the presence of cardiac tamponade.

A	Initiation of thrombolytic therapy with streptokinase

The ECG findings here associated with chest pain may suggest a diagnosis of myocardial infarction. However, the nature of the chest pain should raise the concern of aortic dissection, which must be ruled out prior to giving any blood-thinning agents, as these could kill the patient.

B	Fluid resuscitation and admission to the coronary care unit

This patient likely does require careful fluid resuscitation as he appears to be developing haemodynamic compromise. However, this does not address the reason for the patient's deterioration. Further investigation is required to confirm the likely cause (in this case a possible type A aortic dissection).

C	Urgent computerised tomography of the chest with contrast

This patient likely has a type A aortic dissection. A CT scan of the chest with contrast is the gold standard investigation. However, because this patient has a systolic blood pressure of 90 mmHg and an elevated heart rate, he is probably too unstable to be moved to radiology at this time. The presence of an early diastolic murmur on auscultation suggests the presence of aortic regurgitation secondary to the dissection. If the dissection has involved the aortic valve then it is likely that some aspect of it will be visualised on ECG, which will not require the patient to be moved.

E	Urgent cardiology referral for primary revascularisation

The ST-segment elevation seen on the ECG, combined with chest pain, would be concerning and may suggest an acute right coronary artery occlusion. However, the nature of the chest pain and other clinical features presented should raise the suspicion of aortic dissection. This must be ruled out first before proceeding to coronary angiography.

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Responses Correct:	9
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Responses Total:	56
Responses - % Correct:	16%

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A 63-year-old known diabetic presents to the Emergency Department with sudden onset of severe breathlessness. He says he was feeling completely normal during his evening meal but he suddenly broke out in a cold sweat and felt that he had a major problem in catching his breath. He denies any history of pain or previous episodes of breathlessness. He is on metformin and gliclazide for his diabetes, as well as perindopril for mild hypertension.
On arrival in the resuscitation area he is profoundly diaphoretic and looks unwell. His blood pressure is 145/95 mmHg and his heart rate is 120 beats/min. His oxygen saturations are 86% on room air and improve to 95% on inspired oxygen via a reservoir bag.
Auscultation of his heart reveals a third heart sound, and there are widespread wheezes and crackles on auscultation of his chest.
A bedside glucose test shows a blood glucose concentration of 13.6 mmol/l. His electrocardiogram (ECG) shows ST elevation of 3 mm in leads V_4–V_6.

What is the most appropriate course of action with respect to his long-term outcome?

A	Furosemide 80 mg intravenous (IV) and continuous glyceryl trinitrate iv infusion
B	Aspirin 300 mg stat, IV GTN, and referral for urgent PCI
C	Furosemide 80 mg IV and insulin IV sliding scale
D	Salbutamol nebuliser and IV hydrocortisone
E	Non-invasive ventilation (NIV) using a continuous positive airway pressure mask

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Explanation

B Aspirin 300 mg stat, IV GTN, and referral for urgent PCI

The ECG presented here demonstrates an acute anterior ST-elevation myocardial infarction. Diabetic patients often present with atypical features of myocardial ischemia (including a lack of pain). Aspirin should be given immediately. GTN infusion will reduce cardiac afterload by causing peripheral vasodilation. This should reduce myocardial oxygen requirements and reduce further myocardial injury. However, urgent PCI is required to stent the lesion. This has been shown to have improved outcomes over other treatment options.

A Furosemide 80 mg intravenous (IV) and continuous glyceryl trinitrate iv infusion

This patient has clinical features suggestive of left ventricular failure, including the new respiratory auscultatory findings. The use of furosemide to reduce circulating volume may clinically improve the patient. GTN infusion will reduce peripheral resistance and thus cardiac afterload. Together, these two agents may acutely improve the clinical situation. However, neither deals with the underlying ST-elevation myocardial infarction clearly indicated by the ECG. It is probably this event which is causing the left ventricular dysfunction. Treating the coronary artery occlusion is vital to improving the patient's prognosis.

C Furosemide 80 mg IV and insulin IV sliding scale

Furosemide may improve the clinical picture of left ventricular failure seen in this patient by reducing circulating volume. Additionally, the patient's blood glucose level is raised and a sliding scale will control this. However, neither tackles the underlying myocardial infarction that has precipitating this patient's admission. Urgent PCI is required to improve prognosis. There is evidence to suggest that a sliding scale can improve outcomes in diabetic patients following PCI, and this will likely be instituted on the coronary care unit.

D Salbutamol nebuliser and IV hydrocortisone

The widespread wheeze on respiratory auscultation may be suggestive of an exacerbation of asthma or COPD. However, neither of these diagnoses explains the remaining findings or the ECG changes. The wheeze is probably 'cardiac asthma' secondary to left ventricular failure.

E Non-invasive ventilation (NIV) using a continuous positive airway pressure mask

NIV can be of benefit in patients with significant heart failure, and may be necessary here. However, an underlying cause must be sought for the acute left ventricular dysfunction suggested by the clinical picture. The ECG is supportive of a diagnosis of myocardial infarction. As such, acute angiography ± angioplasty is required to investigate and treat this diagnosis, which will probably improve cardiac function.

6920

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Responses Total:	57
Responses - % Correct:	16%

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A 26-year-old known asthmatic presents to the emergency department complaining of a fluttering in his chest. This started suddenly following the use of his salbutamol inhaler. He says that he usually feels his heart racing after using salbutamol but this usually settles after a couple of minutes. On this occasion the palpitations have lasted for 20 min and he is starting to feel uncomfortable.

On arrival his heart rate is 190 beats/min and his blood pressure is 125/75 mmHg. Auscultation of his heart reveals no murmurs and his chest is clear.

His electrocardiogram (ECG) shows a narrow complex regular tachycardia without any obvious P waves.
Vagal manoeuvres are unsuccessful.

A venous blood sample is taken and run through the blood gas machine. This shows:

pH	7.39
Na^+	137 mmol/l
K^+	4.2 mmol/l

Which of the following would be the pharmacological agent of choice?

A	Intravenous (iv) flecainide
B	iv Digoxin
C	iv Adenosine
D	iv Labetalol
E	iv sotalol

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Calculator

Normal Values

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Explanation

This patient has a supraventricular tachycardia (SVT). Adenosine is contraindicated in asthmatic patients as is beta-blockade with labetolol. The safest alternatives would be IV verapamil or iv flecainide in this patient. This should be done in a closely monitored environment. A rhythm strip should be recorded continuously during the administration of any drug when dealing with SVTs to capture the termination of the arrhythmia. A post-termination electrocardiogram (ECG) should be examined closely for evidence of pre-excitation.

6921

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Responses Total:	58
Responses - % Correct:	16%

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A 73-year-old lady with known congestive cardiac failure is seen in the cardiology outpatients for a review. She has been quite stable for the last two years, with an exercise tolerance of around 100 yards on the flat. Her current regime includes the following.

- Furosemide 40 mg OD
- Ramipril 10 mg OD
- Bisoprolol 2.5 mg OD
- Spironolactone 25 mg OD
- Simvastatin 40 mg ON.

Despite being generally well, she complains of dizzy spells on standing upright in the morning. On a couple of occasions she felt she had to sit down quickly or she would have fallen to the floor. On examination in the clinic her blood pressure is 98/68 mmHg and heart rate 75 beats/min. Her heart sounds are normal and there are very few crackles on auscultation of her chest. There is mild bipedal oedema.

Which of the following would be the most appropriate next step?

A	Reducing the ramipril to 5 mg od
B	Stop bisoprolol
C	Reassurance and 24 h blood pressure and electrocardiogram (ECG) monitoring
D	Stop spironolactone
E	Stop furosemide

6922

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E	Stop furosemide

Explanation

A Reducing the ramipril to 5 mg od

This patient is on an appropriate regimen for congestive cardiac failure. However, she is hypertensive which is leading to symptoms. The combination of medications used for heart failure can all precipitate hypotension. Ideally the patient should remain on some degree of their current medications. As such, a dose reduction of the ramipril may be most appropriate. Alternatively, this could be moved to just before bed to reduce the vasodilatory effect during the day.

B Stop bisoprolol

Bisoprolol may be contributing to the hypotensive episodes from which this patient is suffering. However, there is significant prognostic benefit from remaining on a β-blocker. As such, it should ideally be continued at this time and the large dose of ramipril reduced.

C Reassurance and 24 h blood pressure and electrocardiogram (ECG) monitoring

This patient has a low blood pressure on examination and complains of significant symptoms probably related to postural hypotension. As such, she requires more than reassurance and a change in medications would be appropriate; 24 h blood pressure measurements will likely reveal little more than the clinical history has provided.

D Stop spironolactone

Spironolactone, especially in combination with a loop diuretic, can lead to hypertensive episodes. However, the addition of spironolactone to the pharmacological regimen of patients with heart failure has been shown to have significant mortality benefit. As such, it should not be stopped if other medications can be altered (in this case the ramipril can be reduced).

E Stop furosemide

This patient is clinically not fluid overloaded. Additionally furosemide does not provide a mortality benefit in patients with heart failure. However, stopping the furosemide will likely lead to a recurrence of the heart failure symptoms associated with fluid overload. As such, it should be continued. If she were on a higher dose of loop diuretic, a reduction may be appropriate.

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A 54-year-old man presents to the Emergency Department complaining of a severe headache lasting 12 h. He gives a history of frequent headaches over the last year. There is no history of fevers, neck stiffness or nausea but he does complain of some vague visual disturbances. There is no history of sick contacts. He has no past medical history of note. He is a smoker of 15 cigarettes a day and he drinks about 30 units of alcohol a week.

On examination he is found to be hypertensive, with a blood pressure of 195/105 mmHg and a heart rate of 96 beats/min. Auscultation of his heart reveals normal heart sounds and the chest is clear. Abdominal palpation reveals no palpable masses or organomegaly. A bruit is heard over the left renal artery. There are flame-shaped haemorrhages and cotton-wool spots seen on fundoscopy.

His electrocardiogram (ECG) shows sinus rhythm with left ventricular hypertrophy. A urine dipstick is positive for blood and protein.

Which of the following would be the most appropriate management?

A	Admission to hospital for blood pressure monitoring at least overnight and control
B	Oral ramipril 5 mg, followed by 2 h of observation then discharge
C	Sublingual nifedipine 10 mg and discharge when the blood pressure settles
D	Simple analgesia for the headache, oral nifedipine 10 mg and discharge home with general practitioner (GP) review
E	CT head to rule out a subarachnoid haemorrhage and, if excluded, simple analgesia for the headache

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A 54-year-old man presents to the Emergency Department complaining of a severe headache lasting 12 h. He gives a history of frequent headaches over the last year. There is no history of fevers, neck stiffness or nausea but he does complain of some vague visual disturbances. There is no history of sick contacts. He has no past medical history of note. He is a smoker of 15 cigarettes a day and he drinks about 30 units of alcohol a week.

On examination he is found to be hypertensive, with a blood pressure of 195/105 mmHg and a heart rate of 96 beats/min. Auscultation of his heart reveals normal heart sounds and the chest is clear. Abdominal palpation reveals no palpable masses or organomegaly. A bruit is heard over the left renal artery. There are flame-shaped haemorrhages and cotton-wool spots seen on fundoscopy.

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Explanation

A Admission to hospital for blood pressure monitoring at least overnight and control

This patient has significant hypertension and features of resulting acute end organ damage. In particular the findings on fundoscopy and the urine dipstick are particularly concerning. These features require the patient to undergo acute management and he should be stabilised prior to discharge. Acute lowering of the blood pressure should be balanced against the risk of stroke if the blood pressure is lowered too quickly. Mean arterial BP should be reduced by no more than 25% acutely (within minutes) and then slowly reduced over a number of hours to 100-110 mmHg. A number of agents can be considered, and IV labetalol is suggested as a first-line agent.

B Oral ramipril 5 mg, followed by 2 h of observation then discharge

This strategy may be appropriate if the patient was asymptomatic and had no features of end organ damage. However, in this case, the patient must be stabilised prior to discharge. Ramipril would be the first line medication if this was chronic hypertension. However, in the acute setting it is insufficient and unlikely to have a sufficiently rapid effect. Additionally, the presence of a renal bruit may suggest underlying renal artery stenosis, which would be a contraindication for ACE inhibition.

C Sublingual nifedipine 10 mg and discharge when the blood pressure settles

Sublingual nifedipine can rapidly lower blood pressure. There is concern over its use in this setting, however, as a significant acute drop in blood pressure may precipitate cerebral ischaemia. As such, short-acting nifedipine should be avoided in the acute setting.

D Simple analgesia for the headache, oral nifedipine 10 mg and discharge home with general practitioner (GP) review

Amlodipine would be recommended as a first-line agent for chronic hypertension if this patient was >55 years old or of Afro-Caribbean descent. However, it is not sufficient in this setting where there is significant hypertension with features of end organ damage. GP review is also insufficient as this patient requires close monitoring to ensure end organ effects are not continuing.

E CT head to rule out a subarachnoid haemorrhage and, if excluded, simple analgesia for the headache

A presentation with an acute, severe headache should prompt consideration of a subarachnoid haemorrhage. However, the presence of significant hypertension with eye signs makes this the more likely cause of the headache. Additionally, a CT scan is insufficient to rule out a subarachnoid haemorrhage outside of the first six hours.

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Responses Incorrect:	51
Responses Total:	60
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External Links

BMJ - Best Practice
bestpractice.bmj.com/best-practice/monograph/27/treatment/step-by-step.html

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A 68-year-old man, a known hypertensive, presents to the Emergency Department with a two-day history of severe breathlessness. He says that this has started suddenly and is getting progressively worse. He describes a slight cough with no sputum production. He denies any fevers or chest pains. There is no known history of heart failure or ischaemic heart disease.

On examination he appears grossly overweight, with a blood pressure of 130/85 mmHg and a heart rate of 100 beats/min. His respiratory rate is 30/min and his saturations on air are 90%. His jugular venous pressure is raised, at 4 cm. There are no added sounds on auscultation of his heart and his chest is clear. A bedside qualitative troponin assay is positive.

Electrocardiogram (ECG) shows sinus tachycardia with right bundle branch block. Chest X-ray shows enlarged cardiac shadow but clear lung fields.

Which is the most likely diagnosis in this case?

A	Atypical pneumonia
B	Myocardial infarction
C	Pulmonary embolism
D	Primary pulmonary hypertension
E	Left ventricular failure

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E	Left ventricular failure

Explanation

C Pulmonary embolism

This clinical vignette is suggestive of a PE. Sinus tachycardia is the most common arrhythmia seen in patients with a PE. The presence of RBBB may be chronic; however, acute RBBB may suggest increased right ventricular pressures secondary to a large PE. Additionally the raised JVP suggests right ventricular strain.

A Atypical pneumonia

The presence of breathless and tachycardia may raise suspicion of this diagnosis. However, the lack of sputum production points away from this diagnosis. Additionally, there are no signs of respiratory auscultation to support this diagnosis.

B Myocardial infarction

A raised troponin highlights the presence of myocardial damage but is not specific for a myocardial infarction. Although overweight, no other risk factors for ischaemic heart disease are presented here. Furthermore, the ECG does not support the diagnosis and he does not report chest pain. If a PE was ruled out following appropriate investigations, then this diagnosis could be reconsidered.

D Primary pulmonary hypertension

Typically this condition presents with progressive breathlessness associated with features of right heart failure. Although there are features of acute right ventricular strain, the speed of onset is not supportive of this diagnosis.

E Left ventricular failure

Clinical examination revealed no features supportive of this on assessment of either the cardiovascular or respiratory system. For left ventricular dysfunction to have resulted in significant breathlessness and hypoxia, respiratory auscultatory features would be expected.

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Responses Correct:	9
Responses Incorrect:	52
Responses Total:	61
Responses - % Correct:	15%

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A 68-year-old Caucasian lady with known type 2 diabetes is found to have a blood pressure of 142/92 mmHg and 145/90 mmHg on a couple of visits to her general practitioner's (GP's) surgery. Her diabetes is well controlled on a combination of diet and metformin. She has a previous inferior MI. There is no evidence of hypertensive retinopathy on fundoscopy. Her electrocardiogram (ECG) shows normal sinus rhythm and inferior Q waves.

Which of the following would be the most appropriate next step in this patient's management?

A	Initiation of treatment with amlodipine
B	Initiation of treatment with bendrofluazide
C	Monthly review of blood pressure
D	Initiation of treatment with perindopril
E	Arrangement for 24-h blood pressure monitoring

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D	Initiation of treatment with perindopril
E	Arrangement for 24-h blood pressure monitoring

Explanation

It is important to flag with respect to blood pressure management, the importance of ABPM confirmation of hypertension. This is now recognised by the current NICE guidance. As such, although hypertensives are likely to be required, confirmation of hypertension on ABPM should take place first.

Guidelines on secondary prevention of cardiovascular disease suggest that Type 2 diabetes should be considered a secondary prevention surrogate. As such, treatment of blood pressure should be initiated when average BP is confirmed as being above the target for diabetics (130/80 mmHg in those who have evidence of previous cardiovascular, eye or kidney disease). A 140/80 mmHg target is used for those without evidence of of end-organ damage. Angiotensin-converting enzyme (ACE) inhibitors are recommended as first-line treatment as they can prevent the development of microalbuminuria. However there is some evidence to suggest that certain patient subgroups, in particular African-Carribean patients, do not respond very well to ACE inhibitors.

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Responses Incorrect:	53
Responses Total:	62
Responses - % Correct:	15%

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A 35-year-old man who has recently returned from a holiday abroad presents to the Emergency Department with a history of general malaise, weight loss and arthralgia. He also describes episodes of waking up at night feeling really hot. On close questioning he mentions visiting a tattooing parlour and having an erythematous skin rash around the tattoo site.

On examination, he is found to be pyrexial at 38.1°C and tachycardic at 120 beats/min. On inspection there are petechial haemorrhages in his conjunctival and buccal membranes. Auscultation of his heart reveals no murmurs and his chest is clear.

Electrocardiogram (ECG) shows a sinus tachycardia with a PR interval of 220 ms.

Urinary dipstick is positive for blood.

Investigations:

Hb	14.1 g/dl
WCC	15.6 × 10^9/l
PLT	153 × 10^9/l
Na^+	136 mmol/l
K^+	4.8 mmol/l
Creatinine	83 µ mol/l
Urea	5.0 mmol/l
CRP	135 mg/dl

Which of the following is the most likely diagnosis?

A	Pyelonephritis
B	Infective endocarditis
C	Viral haemorrhagic fever
D	Malaria
E	Rheumatic fever

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A Pyelonephritis

B Infective endocarditis

C Viral haemorrhagic fever

D Malaria

E Rheumatic fever

Explanation

B Infective endocarditis

Infective endocarditis should be considered as a diagnosis in patients with chronic fever, weight loss and malaise even in the absence of murmurs. Conjunctival petechial haemorrhages are far more common than the classical skin signs of splinter haemorrhages, Osler's nodes and Janeway lesions. The presence of a first-degree atrioventricular block (PR interval 220 ms) suggests the involvement of conducting tissue while dipstick haematuria, indicating renal embolic phenomena, should also point towards subacute bacterial endocarditis. The history of skin infection suggests a *Staphylococcus* species as the probable culprit organism.

A Pyelonephritis

In pyelonephritis the urine dipstick usually tests positive for leucocytes/nitrites. Dysuria, abdominal and flank pain are common symptoms.

C Viral haemorrhagic fever

Viral haemorrhagic fevers are a group of illnesses caused by RNA families of viruses, including Ebola and Marburg, Lassa fever and yellow fever. Fever and bleeding are common presenting symptoms. It is important to obtain an accurate travel history as some of the viruses are more prevalent in certain countries. Blood tests frequently demonstrate lymphopenia, thrombocytopenia, deranged LFTs and clotting.

D Malaria

A mosquito-borne infectious disease, it can present with flu-like symptoms and acute febrile illness associated with *paroxysms* (shivering followed by fever and sweating occurring every 2-4 days). Splenomegaly is common. Thin and thick blood films are used in the diagnostic work-up.

E Rheumatic fever

This typically occurs 2-4 weeks following a streptococcal throat infection. It is characterised by fever, painful joints, Sydenham's chorea and erythema marginatum. Rheumatic heart disease, resulting in fibrosis and scarring of heart valves, may be a long-term complication of rheumatic fever.

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A 25-year-old woman is referred to the cardiology department with a history of palpitations. She describes these as of sudden onset and termination associated with a feeling of light-headedness. They have occurred on a couple of occasions while she was running on the treadmill in the gym and she felt she had to stop. She smokes 10 cigarettes a day and denies any heavy alcohol use. There is no past medical history and she is on no regular medication.
On examination there is a systolic murmur at the left lower sternal edge and a prominent apical impulse.
The electrocardiogram (ECG) shows deep T wave inversions in leads V_3–V_5.

Which test is the first line investigation to reveal the underlying diagnosis?

A	Echocardiogram
B	24-h ECG
C	Exercise ECG
D	MIBI scan
E	Thyroid function tests

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A 25-year-old woman is referred to the cardiology department with a history of palpitations. She describes these as of sudden onset and termination associated with a feeling of light-headedness. They have occurred on a couple of occasions while she was running on the treadmill in the gym and she felt she had to stop. She smokes 10 cigarettes a day and denies any heavy alcohol use. There is no past medical history and she is on no regular medication.
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E	Thyroid function tests

Explanation

A	Echocardiogram

The history of palpitations precipitated by exercise and associated with pre-syncope is very sinister. The presence of a systolic murmur and T-wave inversions in the anterior leads makes hypertrophic obstructive cardiomyopathy (HOCM) the most likely diagnosis in this age group. The echocardiogram is key to the diagnosis and monitoring of HOCM. Given the clinical presentation, and echocardiogram should be performed urgently to look for evidence of septal hypertrophy and left ventricular outflow obstruction.

B	24-h ECG

Although this may be performed as part of the diagnostic work-up to risk stratify the patient and look for non-sustained VT (NSVT), the echocardiogram represents a first-line diagnostic test in patients with suspected HOCM.

C	Exercise ECG

Although an exercise treadmill test may be performed, it is not a first-line test. An abnormal blood pressure response to exercise is an important, though non-specific, risk factor for sudden death.

D	MIBI scan

MIBI scanning is more commonly performed to look for significant ischaemia in patients with suspected coronary artery disease.

E	Thyroid function tests

This patient presents with exercise-induced palpitations and has an abnormal resting ECG. Deep T-wave inversion in leads V_3-V_5 is not observed with thyroid dysfunction.

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Responses Total:	64
Responses - % Correct:	14%

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A 39-year-old lady is referred to the cardiology department by her general practitioner (GP) because of the finding of a diastolic murmur on auscultation. She denies any history of rheumatic fever as a child. She has lost about 8 kg in weight over the last 6 months and she has had a couple of episodes when she fainted suddenly.

On examination there is finger clubbing, but no splinter haemorrhages or any petechial haemorrhages. There is a diastolic murmur on auscultation of the heart, which varies greatly with her sitting forward and is associated with a friction rub. Her chest is clear on auscultation.

Investigations by the GP:

Hb	10.1 g/dl
WCC	12.6×10^9/l
PLT	353×10^9/l
Na+	136 mmol/l
K+	4.8 mmol/l
Creatinine	99 mol/l
MCV	85 fl
ESR	47 mm/h
Urea	5.0 mmol/l
CXR	Intracardiac calcification

Which one of the following diagnoses could account for all these findings?

A	Tuberculosis
B	Subacute Infective Endocarditis.
C	Rheumatic mitral valve disease.
D	Systemic lupus erythematosus (SLE)
E	Atrial myxoma

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Investigations by the GP:

Hb	10.1 g/dl
WCC	12.6 × 10^9/l
PLT	353 × 10^9/l
Na+	136 mmol/l
K+	4.8 mmol/l
Creatinine	99 mol/l
MCV	85 fl
ESR	47 mm/h
Urea	5.0 mmol/l
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A Tuberculosis

B Subacute Infective Endocarditis.

C Rheumatic mitral valve disease.

D Systemic lupus erythematosus (SLE)

E Atrial myxoma

Explanation

E Atrial myxoma

Although rare (2 per 100,000 with a female:male ratio of 2:1), the diagnosis of atrial myxoma should be considered in a person who presents with finger clubbing, normocytic anaemia, a positional murmur and intracardiac calcification on the chest X-ray. The history of fainting spells suggests transient left ventricular (mitral valve) inflow obstruction. The patient should undergo urgent echocardiography and be referred for surgery if the diagnosis of myxoma is confirmed, as complete removal is curative.

A Tuberculosis

TB pericarditis may be associated with pericardial, rather than intracardiac, calcification. A diastolic murmur is not associated with uncomplicated TB pericarditis.

B Subacute Infective Endocarditis.

Although subacute bacterial endocarditis can cause native aortic valve endocarditis, which may be associated with aortic incompetence, the murmur associated with this lesion (early or holo-diastolic) does not vary significantly and is not associated with a friction rub or intracardiac calcification.

C Rheumatic mitral valve disease.

Mitral valve stenosis is associated with a mid-diastolic murmur, though in the absence of endocarditis would not be associated with a raised ESR or clubbing.

D Systemic lupus erythematosus (SLE)

SLE may be associated with a raised ESR, but the cardiac and extracardiac features described above are not associated with SLE.

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Responses Total:	1
Responses - % Correct:	0%

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A 67-year-old man presents with exertional breathlessness and intermittent palpitations. On examination his pulse is found to be irregularly irregular at a rate of 120 beats/min. The apex is displaced to the anterior axillary line. Auscultation of his heart reveals a systolic click associated with a late systolic murmur. There are mild bibasal crackles on auscultation of his chest.
His electrocardiogram (ECG) confirms atrial fibrillation with left ventricular hypertrophy.
An echocardiogram confirms the presence of mitral valve prolapse with moderate mitral regurgitation and left ventricular impairment with an ejection fraction of 50%.

Which of the following is the management of choice for reducing his chances of long-term complications?

A	Digoxin plus aspirin
B	Digoxin plus formal anticoagulation with warfarin
C	Anticoagulation with warfarin plus bisoprolol for rate control
D	Amiodarone for rate control plus annual echocardiographic follow-up
E	Trans-oesophageal echocardiogram (TOE) with a view to surgical repair/replacement of the mitral valve followed by long-term oral anticoagulation

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Explanation

E	Trans-oesophageal echocardiogram (TOE) with a view to surgical repair/replacement of the mitral valve followed by long-term oral anticoagulation

This patient has evidence of cardiac decompensation (breathlessness with bi-basal crackles and a displaced apex beat) in the setting of MVP with associated severe mitral regurgitation. Patients under age 75 with mitral valve prolapse (MVP) and who are in atrial fibrillation, or those who have echocardiographic evidence of left ventricular impairment, should be referred for surgical assessment as early as possible. A TOE can demonstrate whether the valve is amenable to repair or needs replacement. This is often performed intra-operatively. Progressive mitral regurgitation is the most serious complication, occurring in about 15% of patients over a 15-year period. Acute hemiplegia, transient ischaemic attacks, cerebellar infarcts, amaurosis fugax and retinal arterioral occlusions all occur more frequently in MVP patients, suggesting that cerebral emboli are actually quite common in this condition.

A	Digoxin plus aspirin

Patients with atrial fibrillation and a CHADS2VASC score of 1 (not due to one female sex) should be considered for formal anticoagulation with warfarin or a novel oral anticoagulant.

B	Digoxin plus formal anticoagulation with warfarin

If patients are anything other than sedentary then digoxin, as a lone antiarrhythmic, is not particularly effective at controlling a fast-ventricular response in patients with atrial fibrillation.

C	Anticoagulation with warfarin plus bisoprolol for rate control

Although the patient should be anticoagulated and commenced on a beta-blocker, such as bisoprolol, medical management does not represent definitive treatment in patients with symptomatic severe MR. Surgical work-up and referral should be undertaken.

D	Amiodarone for rate control plus annual echocardiographic follow-up

The patient is symptomatic due to the severe mitral regurgitation and therefore requires initiation of medical treatment in addition to surgical referral.

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Responses Correct:	0
Responses Incorrect:	2
Responses Total:	2
Responses - % Correct:	0%

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A 19-year-old girl presents to the Emergency Department complaining of palpitations that have started suddenly and have lasted for 20 min. She is now starting to complain of some chest discomfort and dizziness. On arrival she is found to have a heart rate of 180 beats/min and a blood pressure of 95/60 mmHg. The initial electrocardiogram (ECG) confirms the diagnosis of supra-ventricular tachycardia (SVT). This is terminated using 6 mg of adenosine intravenously. The subsequent ECG shows sinus rhythm with a PR interval of 0.08 s and delta waves.

Which of the following is the treatment of choice?

A	Amiodarone
B	Referral for RadioFrequency ablation
C	Flecainide
D	Bisoprolol
E	Mexiletine

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A 19-year-old girl presents to the Emergency Department complaining of palpitations that have started suddenly and have lasted for 20 min. She is now starting to complain of some chest discomfort and dizziness. On arrival she is found to have a heart rate of 180 beats/min and a blood pressure of 95/60 mmHg. The initial electrocardiogram (ECG) confirms the diagnosis of supra-ventricular tachycardia (SVT). This is terminated using 6 mg of adenosine intravenously. The subsequent ECG shows sinus rhythm with a PR interval of 0.08 s and delta waves.

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A	Amiodarone
B	Referral for RadioFrequency ablation
C	Flecainide
D	Bisoprolol
E	Mexiletine

Explanation

B	Referral for RadioFrequency ablation

The presence of an accessory connection between the atria and the ventricles by-passing the atrioventricular node leads to the typical ECG appearance of a short PR interval and a delta-wave on the QRS (pre-excitation ECG). The ECG after the termination of the SVT is characteristic of Wolff–Parkinson–White syndrome (WPW). The prevalence of WPW is around 1/1000, with a male:female ratio of 2:1. The patient is symptomatic when in the SVT (chest discomfort and dizziness in association with palpitations) and should therefore be referred to an electrocardiologist for consideration of an electrophysiological study (EPS) and radiofrequency ablation.

A	Amiodarone

Amiodarone is more commonly used in patients with ventricular arrhythmias and atrial fibrillation.

C	Flecainide

Although flecainide, a class 1C agent that increases the refractoriness of the accessory pathway and exhibits a useful property known as ‘use-dependence’, can be used in the treatment of SVT and uncomplicated WPW with structurally normal hearts, the patient is now back in sinus rhythm and definitive treatment treatment consists of modification of the substrate through radiofrequency of ablation.

D	Bisoprolol

Bisoprolol prolongs conduction time and increases the refractoriness of the AV node. Although beta-blockers are sometimes used in the treatment of AVNT and AVNRT, they are not considered first-line treatment for WPW and hypotension may preclude their use.

E	Mexiletine

Mexiletine, a Class 1B antiarrhythmic which acts as a sodium channel blocker, is used in the treatment of ventricular arrhythmias such as ventricular tachycardia. It is not used in the treatment of WPW.

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Responses Correct:	0
Responses Incorrect:	3
Responses Total:	3
Responses - % Correct:	0%

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A 45-year-old lorry driver presents to the Emergency Department with central crushing chest pain. His initial electrocardiogram (ECG) shows ST elevations in leads V_2–V_5. The patient is undergoes primary percutaneous coronary intervention with one stent to his left anterior descending coronary artery. Following an uneventful 5-day period he is discharged home on aspirin 75 mg, ticagrelor 90 mg bd, bisoprolol 5 mg, ramipril 2.5 mg and atorvastatin 80 mg. He would like to know when he can go back to work. There is no residual chest pain.

Which of the following statements is correct?

A	He has to stop driving, inform the Driver and Vehicle Licensing Agency (DVLA) and return for an exercise tolerance test in 6 weeks on the current regime
B	He has to stop driving, inform the DVLA and return for an exercise tolerance test in 6 weeks after he has stopped his bisoprolol for 48 h
C	He has to stop driving, inform the DVLA and return for an exercise tolerance test in 6 weeks after he has stopped all his medications for 48 h
D	He has to stop driving, inform the DVLA and return for a modified exercise tolerance test in 6 weeks after he has stopped all his medications for 48 h
E	He can return to driving in one month provided an ECG shows preserved left ventricular function

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A 45-year-old lorry driver presents to the Emergency Department with central crushing chest pain. His initial electrocardiogram (ECG) shows ST elevations in leads V_2–V_5. The patient is undergoes primary percutaneous coronary intervention with one stent to his left anterior descending coronary artery. Following an uneventful 5-day period he is discharged home on aspirin 75 mg, ticagrelor 90 mg bd, bisoprolol 5 mg, ramipril 2.5 mg and atorvastatin 80 mg. He would like to know when he can go back to work. There is no residual chest pain.

Which of the following statements is correct?

A	He has to stop driving, inform the Driver and Vehicle Licensing Agency (DVLA) and return for an exercise tolerance test in 6 weeks on the current regime
B	He has to stop driving, inform the DVLA and return for an exercise tolerance test in 6 weeks after he has stopped his bisoprolol for 48 h
C	He has to stop driving, inform the DVLA and return for an exercise tolerance test in 6 weeks after he has stopped all his medications for 48 h
D	He has to stop driving, inform the DVLA and return for a modified exercise tolerance test in 6 weeks after he has stopped all his medications for 48 h
E	He can return to driving in one month provided an ECG shows preserved left ventricular function

Explanation

B	He has to stop driving, inform the DVLA and return for an exercise tolerance test in 6 weeks after he has stopped his bisoprolol for 48 h

For vocational (Group 2) drivers, the DVLA guidelines state that the patient has to complete stage 3 of a Bruce protocol exercise tolerance test. There should be no residual chest pain or significant ECG changes. The only anti-anginal medication this patient is on is bisoprolol, and his symptoms are stable; if it is stopped before the test, this increases the chances of achieving the target heart rate Bruce stage 3. Before speaking to the patient, the DVLA guidelines on the subject can be found on the DVLA website if in doubt (see below).

A	He has to stop driving, inform the Driver and Vehicle Licensing Agency (DVLA) and return for an exercise tolerance test in 6 weeks on the current regime

The beta-blocker is stopped to ensure a satisfactory response of heart rate to exercise.

C	He has to stop driving, inform the DVLA and return for an exercise tolerance test in 6 weeks after he has stopped all his medications for 48 h

Early cessation of anti-platelets is associated with a high risk of stent thrombosis.

D	He has to stop driving, inform the DVLA and return for a modified exercise tolerance test in 6 weeks after he has stopped all his medications for 48 h

A standard Bruce test must be completed.

E	He can return to driving in one month provided an ECG shows preserved left ventricular function

All vocational (Group 2) drivers must not drive and must notify the DVLA after an acute coronary syndrome. Drivers can be re-licensed after at least six weeks if the requirements of the exercise or functional test can be met and there are no other disqualifying conditions.

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Responses Correct:	0
Responses Incorrect:	4
Responses Total:	4
Responses - % Correct:	0%

External Links

Check if a health condition affects your driving
gov.uk/health-conditions-and-driving

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A 28-year-old woman presents with worsening breathlessness. An echocardiogram performed suggests increased pressures in the right heart chambers. She subsequently undergoes a right and left heart catheter study for further assessment.

Blood oxygen saturation investigations:

Sample site	Oxygen saturations (%)
Inferior vena cava	62
Superior vena cava	56
Right atrium	58
Right ventricle	80
Pulmonary artery	82
Arterial saturation	97

These results are most consistent with which of the following?

A	Normal heart
B	Patent foramen ovale
C	Ventricular septal defect (VSD) with no significant left-to-right shunting
D	Atrial septal defect
E	VSD with significant left to right shunt

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Normal Values

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A 28-year-old woman presents with worsening breathlessness. An echocardiogram performed suggests increased pressures in the right heart chambers. She subsequently undergoes a right and left heart catheter study for further assessment.

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C	Ventricular septal defect (VSD) with no significant left-to-right shunting
D	Atrial septal defect
E	VSD with significant left to right shunt

Explanation

E	VSD with significant left to right shunt

There is a step-up in the oxygen saturations between the right atrium and the right ventricle. This suggests the presence of a VSD with left-to-right shunting of oxygenated blood; this blood must have come from the left ventricle. The shunt ratio can be calculated using the Fick equation: Qp = pulmonary flow, Qs = systemic flow, Ao = aortic saturation, MV = mixed venous saturation, PV = pulmonary vein saturation (assumed to be 97%) and PA = pulmonary artery saturation. If we use the numbers given we get a ratio of 2.6, which is significant (>1.5).

A	Normal heart

There is a significant step-up in oxygen saturations between the RA and RV which would not occur without the presence of a shunt at the RV level.

B	Patent foramen ovale

Left-to-right shunting at the level of the PFO would result in a step-up in oxygen saturations at the level of the RA. Rather than there being the normal, gradual fall in oxygen saturations between the level of the IVC and RA, we might expect to see an increase in oxygen levels at the level of the RA compared to the IVC.

C	Ventricular septal defect (VSD) with no significant left-to-right shunting

In the absence of shunting there would not be a step-up in gradient at the level of the RV.

D	Atrial septal defect

In this instance, with left-to-right shunting, there would be a step-up in gradient at the level of the RA.

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Responses Correct:	0
Responses Incorrect:	5
Responses Total:	5
Responses - % Correct:	0%

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A 76-year-old lady with known rheumatoid arthritis presents with a 3-month history of breathlessness. There is no past medical history of ischaemic heart disease or hypertension and she denies any history of chest pains. She has been on celecoxib for her arthritis up to a year ago when she was switched to ibuprofen. She has also been on methotrexate for the last 15 years.
On examination she is found to have a blood pressure of 100/70 mmHg with a heart rate of 125 beats/min and irregular. Her jugular venous pressure (JVP) is raised at 5 cm and there is bipedal oedema to the mid-calf. Her heart sounds are normal and her chest is clear on auscultation.
electrocardiogram (ECG) shows atrial fibrillation with normal complexes. A chest X-ray reveals a small left-sided pleural effusion but normal-sized heart.
An echocardiogram shows normal-sized ventricles with speckled myocardium. There is bi-atrial enlargement with no significant valvular pathology.

Which of the following medications is contraindicated in this case?

A	Digoxin
B	Bisoprolol
C	Atenolol
D	Metoprolol
E	Carvedilol

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Normal Values

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Which of the following medications is contraindicated in this case?

A	Digoxin
B	Bisoprolol
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D	Metoprolol
E	Carvedilol

Explanation

A	Digoxin

This patient has features consistent with restrictive cardiomyopathy. The history of rheumatoid arthritis and the echocardiographic finding of bi-atrial dilatation, ventricular hypertrophy and a speckled appearance to the myocardium make amyloidosis the most likely underlying cause. Digoxin is contraindicated in amyloid patients as the digoxin binds irreversibly to the amyloid fibrils.

B	Bisoprolol

This beta-blocker is a good (first-line) choice for achieving ventricular rate control in atrial fibrillation.

C	Atenolol

This beta-blocker is not contra-indicated in amyloidosis and is an option for rate control in patients with good left ventricular function.

D	Metoprolol

This is a short-acting beta-blocker that can be used for rate control in atrial fibrillation.

E	Carvedilol

Again, this beta-blocker can be used to control ventricular rate in atrial fibrillation, but is more frequently used in heart failure.

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Responses Correct:	0
Responses Incorrect:	6
Responses Total:	6
Responses - % Correct:	0%

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A 65-year-old known chronic obstructive pulmonary disease (COPD) patient has been treated for recurrent chest infections over the last month with courses of co-amoxiclav and clarithromycin by his general practitioner (GP).

On a review consultation the GP notices a high-pitched diastolic murmur on auscultation and refers the patient for echocardiographic assessment. This shows a normal left ventricle with good function and trivial mitral regurgitation. The right ventricle is reported as at the upper limits of normal with evidence of increased pressures and pulmonary regurgitation.

A week later the patient is due to undergo root canal treatment by his dentist.

Which of the following measures would you advise?

A	No need for antibiotic prophylaxis
B	Antibiotic prophylaxis with amoxicillin 3 g orally 1 h prior to the procedure
C	Antibiotic prophylaxis with amoxicillin 1 g intravenous (iv) and gentamicin 120 mg iv
D	Antibiotic prophylaxis with clindamycin 600 mg orally 1 h prior to the procedure
E	Antibiotic prophylaxis with amoxicillin 3 g orally 1 h prior and 4 h after the procedure

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Normal Values

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D	Antibiotic prophylaxis with clindamycin 600 mg orally 1 h prior to the procedure
E	Antibiotic prophylaxis with amoxicillin 3 g orally 1 h prior and 4 h after the procedure

Explanation

This patient's echocardiogram shows trivial mitral regurgitation (which is a normal finding) and pulmonary regurgitation which is secondary to elevated pulmonary pressures, most likely due to his chronic obstructive pulmonary disease (COPD). Although antibiotic prophylaxis was previously indicated in cases of structural pulmonary valve disease recent NICE guidelines indicate that no antibiotic prophylaxis is required for dental procedures (see link to guidelines below).

http://www.nice.org.uk/guidance/CG64

6936

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Responses Correct:	0
Responses Incorrect:	7
Responses Total:	7
Responses - % Correct:	0%

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A 38-year-old man presents to the emergency department in acute cardiac failure. He attends with his wife who reports that his only past medical history of note included lens dislocation and recurrent bilateral shoulder dislocation. Apparently he has suffered from progressively worsening shortness of breath over the past two weeks. He is very tall at 1.93 m in height and he is thin. On examination his blood pressure is 110/55 mmHg (equal in both arms), pulse 110/min, he is peripherally shut down and has pulmonary oedema. There are ejection systolic and short early diastolic murmurs over the aortic area.

What diagnosis fits best with this clinical picture?

A	Acute aortic regurgitation
B	Chronic aortic regurgitation
C	Aortic stenosis
D	Acute left ventricular failure
E	Aortic dissection

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A 38-year-old man presents to the emergency department in acute cardiac failure. He attends with his wife who reports that his only past medical history of note included lens dislocation and recurrent bilateral shoulder dislocation. Apparently he has suffered from progressively worsening shortness of breath over the past two weeks. He is very tall at 1.93 m in height and he is thin. On examination his blood pressure is 110/55 mmHg (equal in both arms), pulse 110/min, he is peripherally shut down and has pulmonary oedema. There are ejection systolic and short early diastolic murmurs over the aortic area.

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A	Acute aortic regurgitation
B	Chronic aortic regurgitation
C	Aortic stenosis
D	Acute left ventricular failure
E	Aortic dissection

Explanation

The causes of this include ascending aortic dissection, infective endocarditis, collagen vascular disorders such as Marfan's, trauma, and dehiscence of a prosthetic valve. The presentation here, with no previous past medical history of note suggests acute aortic regurgitation, his phenotype points to Marfan's as the likely cause. Definitive treatment is aortic valve replacement, with condition at presentation being the major determinant of mortality. Pre-surgery patients should be managed with opiates, if in significant pain or LVF, loop diuretic therapy and nitrates if blood pressure allows. Inotropic support with agents such as dobutamine may also be necessary.

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Responses Correct:	0
Responses Incorrect:	8
Responses Total:	8
Responses - % Correct:	0%

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A 28-year-old woman attends the emergency department complaining of pleuritic chest pain. The pain is central and retrosternal and is relieved by sitting forward. She has recently returned from Australia and has a history of viral infection and flu-like symptoms. There appears to be a friction rub on auscultation, the electrocardiogram reveals saddle-shaped ST elevation, and blood testing reveals normal D-dimers.

What diagnosis fits best with this clinical picture?

A	Acute pericarditis
B	Pulmonary embolus
C	Myocarditis
D	Myocardial infarction
E	Viral pleurisy

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Normal Values

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What diagnosis fits best with this clinical picture?

A	Acute pericarditis
B	Pulmonary embolus
C	Myocarditis
D	Myocardial infarction
E	Viral pleurisy

Explanation

A Acute pericarditis

The presenting symptoms are typical of pericarditic pain. The normal D-dimer and ECG changes (saddle-shaped ST elevation) also point more towards a diagnosis of acute pericarditis vs pulmonary embolus. Viral infections, bacterial sepsis, fungal infections and tuberculosis may all cause acute pericarditis. Other causes include acute myocardial infarction, malignancy, autoimmune disease, granulomatous disease, hypothyroidism, drugs such as hydralazine, and trauma and radiotherapy. The mainstay of therapy for acute pericarditis is pain relief with non-steroidal anti-inflammatory agents; a trial of prednisolone may be useful if pain fails to settle within 48 h.

B Pulmonary embolus

In this instance you would expect the D-dimer to be elevated. The ECG changes are also not typical. A large PE is associated with a sinus tachycardia and ECG features of right ventricular strain. Shortness of breath is also common in this instance.

C Myocarditis

This condition is caused by myocardial inflammation and patients may again present with atypical chest pain and shortness of breath. Patients with myocarditis can either have inflammation limited to the myocardium or it may also extend to involve the pericardium (myopericarditis). Widespread T-wave inversion or saddle-shaped ST segments are common ECG changes. The diagnosis of myocarditis or myopericarditis is based on the presence of there being evidence of myocardial involvement in the inflammatory process; an elevated troponin ± evidence of systolic dysfunction on the echocardiogram or cardiac MRI scan demonstrates myocardial inflammation.

D Myocardial infarction

The pain in the above case is atypical, rather than being suggestive of ischaemia. The universal definition of myocardial infarction requires detection of a rise and/or fall of cardiac biomarker values [preferably cardiac troponin (cTn)] with at least one value above the 99th percentile upper reference limit (URL) and with at least one of the following:

- Symptoms of ischaemia
- New or presumed new significant ST-segment–T wave (ST–T) changes or new left bundle branch block (LBBB)
- Development of pathological Q waves in the ECG
- Imaging evidence of new loss of viable myocardium or new regional wall motion abnormality
- Identification of an intracoronary thrombus by angiography or autopsy.

ECG changes in the case of an acute myocardial infarction are characterised by concave ST-segment elevation in the distribution of a coronary artery territory.

E Viral pleurisy

Pleurisy denotes inflammation of the lining of the lungs. Lone viral pleurisy (not involving the pericardium) is not associated with ECG changes. A pleural 'friction rub', associated with pleurisy, is a squeaking/grating noise caused by inflammation of the pleura. It is characterised by a rub audible during inspiration/expiration – whenever the chest moves. In contrast, a pericardial friction rub is caused by inflammation of the pericardium. In this case the rub is audible each time the heart moves (i.e. with every heartbeat) and is still audible during cessation of breathing.

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Responses Correct:	0
Responses Incorrect:	9
Responses Total:	9
Responses - % Correct:	0%

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A 45-year-old Bulgarian man is admitted via the Emergency Department. He has had a recent history of chronic cough, haemoptysis and weight loss. For the past few days he has suffered increasing shortness of breath, lethargy and exercise intolerance. On examination he looks unwell, he is thin and emaciated, his pulse is 105/min and his blood pressure is 100/60 mmHg. Jugular venous pressure (JVP) is markedly elevated and heart sounds are quiet and muffled; the palpable pulse pressure appears to decrease on inspiration. The electrocardiogram reveals small complexes, and the heart shadow looks globular on X-ray.

Which of following stems represents the best initial management of this case?

A	Intravenous furosemide
B	Sodium nitroprusside
C	Pericardial drainage
D	Bronchoscopy
E	Antibiotic therapy

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A 45-year-old Bulgarian man is admitted via the Emergency Department. He has had a recent history of chronic cough, haemoptysis and weight loss. For the past few days he has suffered increasing shortness of breath, lethargy and exercise intolerance. On examination he looks unwell, he is thin and emaciated, his pulse is 105/min and his blood pressure is 100/60 mmHg. Jugular venous pressure (JVP) is markedly elevated and heart sounds are quiet and muffled; the palpable pulse pressure appears to decrease on inspiration. The electrocardiogram reveals small complexes, and the heart shadow looks globular on X-ray.

Which of following stems represents the best initial management of this case?

A	Intravenous furosemide
B	Sodium nitroprusside
C	Pericardial drainage
D	Bronchoscopy
E	Antibiotic therapy

Explanation

C	Pericardial drainage

This man is of Eastern European extraction and has symptoms of possible tuberculous infection. Tuberculosis is a cause of exudative pericardial effusion, and it is likely that this has accumulated to produce symptoms of impending cardiac tamponade. Over the longer term, patients with tuberculous pericarditis are at risk of cardiac constriction. It is important to consider early use of corticosteroids in conjunction with anti-tuberculous therapy in these patients, as there is some evidence that steroids may reduce the risk of constrictive pericarditis. Advice of a cardiac surgeon is recommended, as pericardectomy may be required in some patients with recurrent pericardial effusions. In this instance drainage is both therapeutic and diagnostic - it allows relief of symptoms and the potential for culture and sensitivity of the fluid.

A	Intravenous furosemide

Although pericardial effusions secondary to fluid overload and congestive cardiac failure may be partially responsive to intravenous diuretics, this is not the case for reactive or infective effusions.

B	Sodium nitroprusside

Anti-hypertensives are not used in the management of pericardial effusions or tamponade. Its use in this instance would be inappropriate and may worsen the clinical picture.

D	Bronchoscopy

Although bronchoscopy, bronchoalveolar washings or transbronchial needle aspiration may be used in the diagnostic work-up for TB, it is not a diagnostic or therapeutic treatment for pericardial effusion.

E	Antibiotic therapy

Although antibiotics form the mainstay of treatment for TB, in the current clinical scenario the patient has features of a large pericardial effusion and impending tamponade, which needs to be relieved to prevent further clinical deterioration.

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Responses Incorrect:	10
Responses Total:	10
Responses - % Correct:	0%

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A 28-year-old woman is referred by the casualty department after suffering an attack of paroxysmal atrial fibrillation. The casualty officer noticed that she had a mid-systolic murmur, loudest in the pulmonary area, and fixed splitting of the second heart sound. He also noticed that the pulmonary arterial tree appeared particularly prominent on chest X-ray. He was concerned about a valve defect. The electrocardiogram reveals right bundle-branch block and right-axis deviation. Routine bloods are unremarkable.

What diagnosis fits best with this clinical picture?

A	Mitral regurgitation
B	Mitral stenosis
C	Ventricular septal defect
D	Atrial septal defect
E	Subacute bacterial endocarditis

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A 28-year-old woman is referred by the casualty department after suffering an attack of paroxysmal atrial fibrillation. The casualty officer noticed that she had a mid-systolic murmur, loudest in the pulmonary area, and fixed splitting of the second heart sound. He also noticed that the pulmonary arterial tree appeared particularly prominent on chest X-ray. He was concerned about a valve defect. The electrocardiogram reveals right bundle-branch block and right-axis deviation. Routine bloods are unremarkable.

What diagnosis fits best with this clinical picture?

A	Mitral regurgitation
B	Mitral stenosis
C	Ventricular septal defect
D	Atrial septal defect
E	Subacute bacterial endocarditis

Explanation

D	Atrial septal defect

ASD is often first diagnosed in adulthood and represents one-third of all adult congenital heart disease. It is two to three times more common in women compared to men. Communication at the level of the atria allows left-to-right shunting of blood, leading to considerable increase in right heart output. Eventually this results in pulmonary hypertension. Patients often present with atrial fibrillation. There is fixed splitting of S2 on auscultation, and a mid-systolic murmur loudest in the pulmonary area. Chest X-ray may reveal pulmonary plethora, and the electrocardiogram shows right bundle-branch block. Significant ASDs should be repaired below the age of 10 years, or as soon as possible if diagnosed in adulthood.

A	Mitral regurgitation

Mitral regurgitation results in a pan-systolic murmur and left ventricular failure, rather than the picture seen here.

B	Mitral stenosis

Mitral stenosis has a loud opening snap and a mid-diastolic rumbling murmur, loudest at the left sternal edge.

C	Ventricular septal defect

VSDs result in a pan-systolic murmur, with haemodynamically significant VSDs presenting earlier than age 28.

E	Subacute bacterial endocarditis

There is nothing in the history to suggest subacute bacterial endocarditis, and the normal blood screen also makes this less likely as the underlying diagnosis.

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Responses Correct:	0
Responses Incorrect:	11
Responses Total:	11
Responses - % Correct:	0%

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A 19-year-old man who was adopted soon after birth presents to the cardiology clinic for a consultation. He had attempted to trace his family and was informed by his blood relatives that his father died suddenly of a 'heart problem'. On examination he looks well but has a harsh systolic murmur which increases with the Valsalva manoeuvre and decreases with squatting. Echocardiography reveals ventricular hypertrophy, particularly of the septum, with increased ejection fraction. Outflow gradient measured by echocardiography is 35 mmHg.

What is the treatment of choice in this patient if he was to develop symptoms of dyspnoea?

A	Cardiac myomectomy
B	Digoxin
C	Beta-blockade
D	Diuretic therapy
E	Nitrate therapy

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A	Cardiac myomectomy
B	Digoxin
C	Beta-blockade
D	Diuretic therapy
E	Nitrate therapy

Explanation

C	Beta-blockade

This patient has hypertrophic obstructive cardiomyopathy (HOCM). The disease exists in two major forms: a familial one that presents in young patients and has been mapped to chromosome 14q, and a sporadic form usually found in the elderly. In HOCM there is marked hypertrophy of the myocardium with a disproportionate increase in the size of the septum. Sufferers are prone to sudden death related to cardiac arrhythmias. Symptoms of cardiac failure respond initially to medical therapy with beta blockade, and this is therefore the initial intervention of choice.

A	Cardiac myomectomy

Myomectomy is reserved for patients where the outflow gradient is greater than 50 mmHg or there are significant symptoms despite beta blocker therapy. Surgery is usually avoided for as long as possible. Ventricular arrhythmias are managed with an implantable cardioverter defibrillator.

B	Digoxin

Digoxin has no effect on outcome in HOCM and is now largely reserved for elderly patients with AF not suitable for other interventions, and for those elderly patients with symptomatic heart failure despite other interventions.

D	Diuretic therapy

Diuretic therapy does not improve outcomes in HOCM and should be used cautiously because of its effect on left ventricular volume.

E	Nitrate therapy

Nitrate therapy can significantly reduce ventricular filling pressure and exacerbate the risk of syncope in HOCM.

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Session Progress

Responses Correct:	0
Responses Incorrect:	12
Responses Total:	12
Responses - % Correct:	0%

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A 72-year-old woman is admitted to the emergency department after collapsing in church. A parishioner who felt her neck at the time reports that the woman was pulseless for a few seconds. She quickly recovers on admission to the department and is discharged home. Holter monitor and MIBI (2-methoxyisobutyl isonitrile) scan as an outpatient are unremarkable. You arrange a tilt-table test, and carotid sinus massage during the test results in profound bradycardia and syncope.

What is the best choice for management of this patient?

A	Fludrocortisone
B	Single-chamber pacemaker
C	Dual-chamber pacemaker
D	Atenolol
E	Midodrine

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A 72-year-old woman is admitted to the emergency department after collapsing in church. A parishioner who felt her neck at the time reports that the woman was pulseless for a few seconds. She quickly recovers on admission to the department and is discharged home. Holter monitor and MIBI (2-methoxyisobutyl isonitrile) scan as an outpatient are unremarkable. You arrange a tilt-table test, and carotid sinus massage during the test results in profound bradycardia and syncope.

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E	Midodrine

Explanation

This patient has carotid sinus hypersensitivity (CSH), demonstrating an exaggerated response to carotid sinus stimulation. The diagnosis is only made after ischaemic heart disease or rhythm disturbance have been reasonably excluded, as in this case. CSH may be predominantly cardioinhibitory (resulting in bradycardia), vasodilatory (resulting in hypotension), or a mixture of the two. Cardioinhibitory CSH is usually managed with insertion of a dual-chamber pacemaker, and vasodilatory CSH is managed with support stockings, fludrocortisone and midodrine (available on a named-patient basis in the UK).

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Difficulty: Easy

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Responses Correct:	0
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Responses Total:	13
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A 54-year-old man is referred by his general practitioner (GP). He is a smoker of 20 cigarettes per day and has suffered from exertional angina for the past few months. On this occasion he has been referred after a collapse at a wedding. Atenolol has not improved his symptoms of angina and the GP is looking for further advice. On examination in the clinic his blood pressure is 165/120 mmHg, his pulse is 80/min and regular and he has an ejection systolic murmur radiating to the carotids.

What is the next stage in the management of this patient?

A	Echocardiography
B	Add isosorbide dinitrate
C	Add amlodipine
D	Refer for exercise rehabilitation
E	Refer for smoking cessation

7033

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Normal Values

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What is the next stage in the management of this patient?

A	Echocardiography
B	Add isosorbide dinitrate
C	Add amlodipine
D	Refer for exercise rehabilitation
E	Refer for smoking cessation

Explanation

A	Echocardiography

The rapidly increasing angina symptoms, syncopal attack and ejection systolic murmur point to the possibility of aortic stenosis. Assessment of valve status is essential as a range of interventions may exacerbate symptoms in critical valve stenosis.

In this age group, aortic stenosis is most likely to be due to congenital bicuspid aortic valve. In the over-70 age group, aortic stenosis is more likely to be due to senile valvular degeneration. Assessment for valve replacement depends on comorbidity and flow gradient across the aortic valve, as assessed by echocardiography and cardiac catheterisation. In general, surgical mortality from aortic valve replacement in patients with normal left ventricular function is less than 5%.

B	Add isosorbide dinitrate

Nitrates may significantly reduce ventricular filling pressure, reducing cardiac output to a critically low level because of valve stenosis.

C	Add amlodipine

This patient may benefit from improved blood pressure control, but with respect to triaging interventions, aortic stenosis should be excluded first.

D	Refer for exercise rehabilitation

Although this has been shown to improve prognosis in angina, significant aortic stenosis will limit its impact. Hence an ECHO is the required next step.

E	Refer for smoking cessation

Smoking cessation is important in managing future risk of ischaemic cardiovascular events, although it won't significantly impact on symptoms of critical aortic stenosis, which needs excluding first.

7033

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Responses Correct:	0
Responses Incorrect:	14
Responses Total:	14
Responses - % Correct:	0%

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A 52-year-old man with type-2 diabetes receives a coronary artery stent having suffered a sub-endocardial myocardial infarction. Six months later he re-presents with worsening chest pain. On reviewing the notes you see that the stent was uncoated. In studies,

What percentage of uncoated stents re-stenose in type-2 diabetes patients by month six?

A	10%
B	20%
C	80%
D	30%
E	45%

7035

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Calculator

Normal Values

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A 52-year-old man with type-2 diabetes receives a coronary artery stent having suffered a sub-endocardial myocardial infarction. Six months later he re-presents with worsening chest pain. On reviewing the notes you see that the stent was uncoated. In studies,

What percentage of uncoated stents re-stenose in type-2 diabetes patients by month six?

A	10%
B	20%
C	80%
D	30%
E	45%

Explanation

Studies have shown that in patients with type-2 diabetes, coronary stents are liable to re-stenosis at a rate of 40–50% by the end of a 6-month follow-up period. Drug eluting stents have been shown to reduce the relative risk of re-stenosis by around 80%, but only where dual anti-platelet therapy with clopidogrel and aspirin is continued for at least 1 year. Pioglitazone has been shown to reduce in stent re-stenosis, but given it is a cause of fluid retention and may worsen heart failure, any effect on stent re-stenosis is subsidiary to increased risk of heart failure.

7035

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Difficulty: Difficult

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Session Progress

Responses Correct:	0
Responses Incorrect:	15
Responses Total:	15
Responses - % Correct:	0%

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You are asked to review a 48-year-old woman who has been treated for hypertension, diabetes managed with diet, well-controlled atrial fibrillation, has had two failed cardioversions, and has a ventricular rate of 75 beats/min. An echocardiogram reveals a structurally normal heart. She is worried about having a stroke. She has no other significant past medical history.

What is the treatment intervention for her?

A	Warfarinisation
B	Aspirin
C	Clopidogrel
D	Aspirin and clopidogrel concurrently
E	Reassurance

7036

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Calculator

Normal Values

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You are asked to review a 48-year-old woman who has been treated for hypertension, diabetes managed with diet, well-controlled atrial fibrillation, has had two failed cardioversions, and has a ventricular rate of 75 beats/min. An echocardiogram reveals a structurally normal heart. She is worried about having a stroke. She has no other significant past medical history.

What is the treatment intervention for her?

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B	Aspirin
C	Clopidogrel
D	Aspirin and clopidogrel concurrently
E	Reassurance

Explanation

A	Warfarinisation

NICE guidelines suggest that warfarinisation is the optimal management for patients with persistent atrial fibrillation and who are at risk of embolic stroke according to their algorithm. CHADS2-VASc supports the use of warfarin: with a score of 3, it incorporates female sex, presence of CHF, blood pressure, age, diabetes mellitus and presence of a prior stroke or TIA. ESC guidelines also promote progression to warfarin.

B	Aspirin

Anti-platelet therapy alone is inadequate to reduce stroke risk versus anti-coagulation in this patient.

C	Clopidogrel

Although in a secondary prevention population clopidogrel reduced the absolute risk of major adverse cardiovascular events by 0.5% versus aspirin alone, it's still inferior to anti-coagulation in patients with chronic atrial fibrillation.

D	Aspirin and clopidogrel concurrently

The MATCH trial in a high-risk secondary prevention population didn't offer a significant advantage with respect to event prevention versus either agent alone, but did increase the risk of bleeding. Anti-platelet agents are known to be ineffective versus anti-coagulation in patients with chronic AF.

E	Reassurance

This patient's CHADS2-vasc score is significantly elevated, driving the need for anti-coagulation.

7036

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Difficulty: Average

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Responses Correct:	0
Responses Incorrect:	16
Responses Total:	16
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External Links

Management for people presenting acutely with atrial fibrillation
nice.org.uk/guidance/cg180/chapter/1-Recommendations#management-for-people-...

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A 47-year-old woman is referred for an opinion with atrial fibrillation. She has suffered increasing tiredness over the past few months, consulted her GP and was noted to be in AF. On examination she has a small-volume pulse, distended jugular veins, left parasternal lift, a tapping apex impulse and there is a loud first heart sound and a mitral early- to mid-diastolic murmur. There also appears to be a mid-diastolic tricuspid murmur.

What diagnosis fits with this clinical picture?

A	Mitral stenosis
B	Atrial septal defect
C	Tricuspid regurgitation
D	Lutembacher syndrome
E	Eisenmenger's syndrome

7037

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Calculator

Normal Values

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What diagnosis fits with this clinical picture?

A	Mitral stenosis
B	Atrial septal defect
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E	Eisenmenger's syndrome

Explanation

D	Lutembacher syndrome

This was first described in 1916 by Lutembacher, and is a syndrome characterised by both mitral stenosis and atrial septal defect (ASD). Both conditions may be congenital and occur concurrently, or the mitral stenosis may occur as a result of rheumatic fever or some other cause. The incidence of Lutembacher syndrome is higher in women due to the greater incidence of congenital ASD. Cardiac signs are mixed due to the two concurrent lesions. Presentation is typically in later life, with fatigue or atrial fibrillation. Ideally, surgery should be performed as early as possible due to the risks of Eisenmenger syndrome in untreated patients.

A	Mitral stenosis

The mid-diastolic tricuspid murmur fits with increased tricuspid valve flow, consistent with a shunt because of an ASD, and hence isolated mitral stenosis is ruled out here.

B	Atrial septal defect

An isolated ASD is ruled out because of the presence of the mitral murmur here.

C	Tricuspid regurgitation

The presence of the mitral murmur makes Lutembacher syndrome with increased tricuspid flow a much more likely diagnosis than isolated tricuspid regurgitation.

E	Eisenmenger's syndrome

Eisenmenger syndrome leads to cyanotic heart disease because of reversal of a long-standing left-to-right shunt to a right-to-left cardiac shunt.

7037

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Responses Correct:	0
Responses Incorrect:	17
Responses Total:	17
Responses - % Correct:	0%

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You see a 20-year-old man in clinic who has been referred for investigation of mild heart failure, for which his general practitioner prescribed furosemide 40 mg twice daily. This resulted in some improvement in symptoms. On examination the patient appears well. He has a sinus tachycardia of 110 beats/min and blood pressure is 120/85 mmHg. Chest examination reveals mild, coarse crepitations at both lung bases. You also note that he has hypertrophied calves, but examination of his lower limbs reveals weakness of both proximal muscles and plantar flexion. Reflexes are normal. The patient has had a trans-thoracic echocardiogram which showed a dilated left ventricle with global hypokinesia and an ejection fraction of <50%.

Investigations:

Hb	12.6 g/dl (13–18)
WCC	8×10^9/l ($4–11 \times 10^9$)
Urea	6 mmol/l (2.5–7.5)
Creatinine	90 mmol/l (60–110)
Potassium	3.8 mmol/l (3.5–4.9)
Sodium	140 mmol/l (137–144)
Chloride	100 mmol/l (95–107)
Creatinine kinase	2100 U/l (24–195)

What is the most likely diagnosis?

A	Viral myocarditis
B	Fascio-scapulo-humeral muscular dystrophy
C	Becker's muscular dystrophy
D	Duchenne's muscular dystrophy
E	Myotonic dystrophy

7244

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Calculator

Normal Values

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You see a 20-year-old man in clinic who has been referred for investigation of mild heart failure, for which his general practitioner prescribed furosemide 40 mg twice daily. This resulted in some improvement in symptoms. On examination the patient appears well. He has a sinus tachycardia of 110 beats/min and blood pressure is 120/85 mmHg. Chest examination reveals mild, coarse crepitations at both lung bases. You also note that he has hypertrophied calves, but examination of his lower limbs reveals weakness of both proximal muscles and plantar flexion. Reflexes are normal. The patient has had a trans-thoracic echocardiogram which showed a dilated left ventricle with global hypokinesia and an ejection fraction of <50%.

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D	Duchenne's muscular dystrophy
E	Myotonic dystrophy

Explanation

C Becker's muscular dystrophy

Becker's muscular dystrophy is an X-linked genetic disorder resulting from a mutation in the dystrophin gene. The clinical picture is similar to that of Duchenne's muscular dystrophy but it is much milder. Patients usually present between the ages of 5 and 15 years, though presentation may not be until the fourth or fifth decade. Patients may present with heart failure secondary to dilated cardiomyopathy rather than the classic proximal muscle weakness. Inheritance is X-linked recessive.

A Viral myocarditis

Viral myocarditis presents with a rapid deterioration in ejection fraction leading to marked cardiac failure; patients can often identify a precipitating illness.

B Fascio-scapulo-humeral muscular dystrophy

FMD very rarely affects cardiac or respiratory muscles compared to other forms of muscular dystrophy. It is more likely to be associated with high-tone deafness and defects of night vision.

D Duchenne's muscular dystrophy

DMD presents at a much earlier age and with more severe proximal muscle weakness than that seen here.

E Myotonic dystrophy

Myotonic dystrophy presents as progressive muscle weakness with increased tone and cardiac conduction defects rather than the frank cardiac failure seen here.

7244

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Responses Correct:	0
Responses Incorrect:	18
Responses Total:	18
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A 40-year-old woman presents to the Accident and Emergency Department with palpitations and light-headedness. The symptoms began suddenly 3 h ago while she was playing golf. She is otherwise well and has no significant past history. On examination she appears well, with a normal respiratory rate. Her blood pressure is 120/75 mmHg. She is afebrile. Her electrocardiogram (ECG) reveals a regular narrow complex tachycardia with a rate of 170/min. There are no flutter waves, but retrograde p-waves are visible in the inferior leads.

What is the most appropriate initial management?

A	DC cardioversion
B	Amiodarone
C	Adenosine
D	Vagal manoeuvres
E	Anticoagulation, (followed by DC cardioversion in 4 weeks)

7245

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Calculator

Normal Values

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Explanation

D	Vagal manoeuvres

The most likely diagnosis is paroxysmal SVT, where vagal manoeuvres are the optimal first-line treatment where blood pressure is stable. These slow conduction in the AV node, potentially interrupting any re-entrant circuit. The absence of flutter waves excludes atrial flutter. Retrograde p-waves in the inferior leads are typical of supraventricular tachycardia. Most of the patients who present with paroxysmal SVT have an AV nodal re-entrant arrhythmia. These arrhythmias depend on AV nodal conduction and therefore can be terminated by transiently blocking AV nodal conduction.

A	DC cardioversion

In this situation, DC cardioversion is only really required for patients resistant to vagal manoeuvres or adenosine, or where there is significant haemodynamic compromise.

B	Amiodarone

Amiodarone is the preferred intervention for atrial fibrillation where there is a past history of structural or ischaemic heart disease.

C	Adenosine

Adenosine blocks AV nodal conduction and is the preferred intervention in patients who fail to cardiovert with vagal stimulation, where there is no past history of asthma.

E	Anticoagulation, (followed by DC cardioversion in 4 weeks)

Anticoagulation is preferred for patients with more prolonged tachycardia due to AF, where risk of embolism is increased.

7245

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Difficulty: Easy

Peer Responses %

Session Progress

Responses Correct:	0
Responses Incorrect:	19
Responses Total:	19
Responses - % Correct:	0%

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A 35-year-old woman presents to the Accident and Emergency Department with a 2-day history of dyspnoea on minimal exertion, paroxysmal nocturnal dyspnoea and a non-productive cough. She is 36 weeks' pregnant with twins, the pregnancy having been thus far uncomplicated. She has had two previous uncomplicated pregnancies which resulted in normal vaginal deliveries. There is no history of headache, visual disturbance, abdominal pain or peripheral oedema. There is no history of cardiovascular disease. There is no history of alcohol or illicit drug ingestion. She is a non-smoker. On examination the patient is tachypnoeic with a respiratory rate of 28/min and she has a tachycardia of 130/min. Her pulse is regularly regular. She has an elevated jugular venous pulse, a loud P2 and coarse crackles at both lung bases. Blood pressure is 100/60 mmHg. There is no hyper-reflexia or clonus. She is afebrile. A chest X-ray performed with abdominal shielding reveals cardiomegaly and bilateral pulmonary oedema. Transthoracic echocardiography reveals left systolic dysfunction with an ejection fraction of 30%. Urinalysis is normal. Full blood count, urea and electrolytes, troponin and liver function tests are all within normal limits. The ECG reveals sinus tachycardia. There are no ischaemic changes.

What is the most likely diagnosis?

A	Pre-eclampsia
B	Eclampsia
C	Hypertensive cardiomyopathy
D	Non-cardiogenic pulmonary oedema of pregnancy
E	Peripartum cardiomyopathy

7247

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Calculator

Normal Values

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Explanation

E	Peripartum cardiomyopathy

Peripartum cardiomyopathy is a dilated cardiomyopathy of uncertain aetiology occurring in the last month of pregnancy or within 5 months after delivery. Symptoms are the same as those of cardiac failure in non-pregnant patients. In order to make the diagnosis there must be (1) absence of any other cause for the cardiac failure, (2) absence of heart disease before the last month of pregnancy and (3) documented systolic dysfunction.

A	Pre-eclampsia

Pre-eclampsia is an important differential and must be excluded. A history of visual disturbance, headache, abdominal pain and peripheral oedema along with hyper-reflexia, clonus, right-upper-quadrant tenderness, renal impairment and proteinuria all suggest pre-eclampsia.

B	Eclampsia

Ecalmpsia presents with precipitously high blood pressure, decreased consciousness and seizures.

C	Hypertensive cardiomyopathy

Hypertensive cardiomyopathy is unusual in the context of pregnancy, and the blood pressure of 100/60 effectively rules this out.

D	Non-cardiogenic pulmonary oedema of pregnancy

The reduced ejection fraction of 30% suggests this patient has cardiac failure rather than non-cardiogenic pulmonary oedema.

7247

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Responses Correct:	0
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Responses Total:	20
Responses - % Correct:	0%

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A 16-year-old congenitally deaf girl is brought into the accident and emergency department following an episode of collapse which occurred while playing tennis. She had fallen to the ground unconscious and spontaneously recovered consciousness a couple of minutes later. The previous week she had begun a course of clarithromycin for a chest infection. When you see her, her vital signs are stable and examination of the cardiovascular and respiratory systems are unremarkable. An electrocardiogram (ECG) is performed which reveals sinus rhythm with a rate of 70/min, a P-R interval of 0.15 s, a QRS interval of 0.11 s and a corrected QT interval of 0.48 s.

What is the most likely diagnosis?

A	Romano–Ward syndrome
B	Jervell–Lange-Nielsen syndrome
C	Wolff–Parkinson–White syndrome
D	Lown–Ganong–Levine syndrome
E	Brugada syndrome

7248

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Calculator

Normal Values

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C	Wolff–Parkinson–White syndrome
D	Lown–Ganong–Levine syndrome
E	Brugada syndrome

Explanation

The answer is Jervell–Lange-Nielsen syndrome

The normal range for the duration of the corrected QT interval (QT_c) is 0.35–0.43 s. Long QT syndrome is a congenital disorder characterised by a prolonged QT interval. When it is associated with congenital deafness it is termed Jervell–Lange-Nielsen syndrome. Long QT syndrome carries a risk of ventricular tachyarrhythmias which may present with syncope, cardiac arrest or sudden death. The risk of tachyarrhythmias is increased by hypomagnesaemia, hypokalaemia and drugs which prolong the QT interval, of which clarithromycin is one. Beta-blockers are the drugs of choice for patients with Long QT syndrome.

7248

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Session Progress

Responses Correct:	0
Responses Incorrect:	21
Responses Total:	21
Responses - % Correct:	0%

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A 55-year-old male is referred by his general practitioner for evaluation of syncope, which occurred during his brisk morning walk. The patient is known to have hypercholesterolaemia and is taking simvastatin 20 mg OD. He is a lifelong non-smoker and has no family history of coronary artery disease. On further questioning he admits to passing out on two previous occasions over the past 3 months. He weighs 72 kg and his height is 170 cm. His blood pressure (BP) is 110/90 mmHg, carotid pulse is slow rising and apex beat is palpable at the 5th intercostal space. The first heart sound is normal, the second heart sound is soft; there is an ejection systolic murmur at the 2nd right intercostal space, radiating to both carotids.

Investigations:

Total cholesterol	6.4 mmol/l
Low-density lipoprotein (LDL)	3.8 mmol/l
High-density lipoprotein (HDL)	1.05 mmol/l

Electrocardiogram (ECG) reveals left ventricular hypertrophy. Chest X-ray is unremarkable. Echocardiogram reveals mean aortic valve area of 0.5 cm^2 and peak transvalvular gradient of 80 mmHg.

What is the next step in this patient's management?

A	Percutaneous aortic balloon valvulotomy
B	Aortic valve replacement
C	Treadmill stress test
D	Coronary angiography
E	Start an ACE inhibitor

7423

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Calculator

Normal Values

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A Percutaneous aortic balloon valvulotomy

B Aortic valve replacement

C Treadmill stress test

D Coronary angiography

E Start an ACE inhibitor

Explanation

D Coronary angiography

This patient has severe symptomatic (syncope) aortic stenosis (AS) as shown by the mean aortic valve area of 0.5 cm^2 and mean peak transvalvular gradient of 80 mmHg. All symptomatic patients with severe AS should undergo aortic valve replacement, as prognosis without surgery is poor. Coronary artery disease (CAD) is common in patients with AS and this patient's age, sex and hypercholesterolaemia put him at risk of CAD. Therefore he should undergo cardiac angiography to assess the need for revascularisation at the time of surgery, in the form of coronary artery bypass grafting.

A Percutaneous aortic balloon valvulotomy

Balloon valvotomy is inferior with respect to outcomes versus surgical valve replacement. It may be considered as a bridge to surgery in unstable patients.

B Aortic valve replacement

Progressing straight to aortic valve replacement is not advised; significant coronary artery disease should be ruled out first, as CABG may be required at the same time as valve replacement.

C Treadmill stress test

In a patient with severe aortic stenosis, a treadmill stress test may precipitate a syncopal episode and should therefore be avoided.

E Start an ACE inhibitor

This risks a significant reduction in ventricular filling pressure and increases the risk of collapse.

7423

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Difficulty: Difficult

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Responses Correct:	0
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Responses Total:	22
Responses - % Correct:	0%

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A 45-year-old male known to have idiopathic dilated cardiomyopathy and ejection fraction of 30% is evaluated in the clinic. He is on digoxin 0.125 mg OD, furosemide 40 mg BD and enalapril 10 mg BD. He is able to walk 200 m on the flat although he reports significant shortness of breath. He weighs 78 kg, pulse is 70 beats/min, jugular venous pulse (JVP) is 1 cm above the sternal notch, BP is 123/82. Both heart sounds are normal with no murmur, chest is clear on auscultation and there is a trace of pedal oedema. He is started on bisoprolol 5 mg per day. The patient comes to the clinic 4 weeks later and still reports tiredness and shortness of breath on minimal exercise. His BP is 127/82, with pulse 67 beats/min and regular.

What is the most appropriate next step in this patient's management

A	Increase the digoxin dose to 0.25 mg OD
B	Change enalapril to sacubitril/valsartan
C	Increase the furosemide dose to 120 mg per day
D	Add bendroflumethiazide 2.5 mg
E	Add ivabradine 5 mg BD

7424

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Calculator

Normal Values

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Explanation

B	Change enalapril to sacubitril/valsartan

In patients with symptoms of heart failure not controlled on ACE inhibitors alone, switching to the combination of ARB and neprilysin inhibitor can further improve symptoms and quality of life. In the PARADIGM-HF trial, the combination of sacubitril and valsartan reduced cardiovascular death and heart failure hospitalisations by 20%.

A	Increase the digoxin dose to 0.25 mg OD

Increasing the digoxin is not appropriate; although modest doses may reduce symptoms of heart failure, digoxin itself has no positive impact on cardiovascular outcomes and may increase mortality in certain patient groups.

C	Increase the furosemide dose to 120 mg per day

There is no indication of a worsening of fluid overload, and increasing the loop diuretic won't have a positive impact on outcomes.

D	Add bendroflumethiazide 2.5 mg

Although adding a thiazide diuretic may have a positive impact on fluid overload, it isn't indicated here given that fluid status is stable and furosemide dose has not been maximised.

E	Add ivabradine 5 mg BD

Ivabradine is only indicated where pulse rate is greater than 75 beats per minute.

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External Links

Angiotensin-neprilysin inhibition versus enalapril in heart failure
ncbi.nlm.nih.gov/pubmed/25176015

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A 58-year-old male presents with a history of left-sided chest pain on exertion. He has a 30-pack-year history of smoking. Physical examination reveals blood pressure (BP) 98/65 mmHg, pulse 88 beats/min and respiratory rate 14/min. There is a delayed carotid upstroke, sustained apex beat, normal 1st heart sound, the aortic component of the 2nd heart sound is soft and the 4th heart sound is audible.

Investigations:

ECG	Left ventricular hypertrophy
Chest X-ray	Normal
Echocardiography	Calcific aortic stenosis with valve surface area of 0.5cm^2 and peak systolic gradient of 90 mmHg

The patient undergoes coronary angiography that reveals 80% stenosis in the proximal left anterior descending (LAD) artery.

Which of the following is the best management option for this patient?

A	Balloon aortic valvotomy plus angioplasty and stenting of the LAD
B	Angioplasty and stenting of the LAD followed by aortic valve replacement (AVR)
C	AVR and bypass grafting of the LAD using the left internal mammary artery (LIMA)
D	AVR and LAD bypass grafting using saphenous vein graft
E	Saphenous vein grafting followed by balloon valvotomy

7428

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Calculator

Normal Values

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Explanation

C	AVR and bypass grafting of the LAD using the left internal mammary artery (LIMA)

This patient has severe symptomatic aortic stenosis, which is an indication for aortic valve replacement. He also has LAD stenosis. As the patient is to have AVR, a concomitant bypass grafting of the LAD using the LIMA is the most appropriate option. The long-term patency of the LIMA is superior to that of a saphenous vein graft.

A	Balloon aortic valvotomy plus angioplasty and stenting of the LAD

This potentially combines two inferior approaches, both with respect to fixing the aortic valve stenosis and relieving myocardial ischaemia.

B	Angioplasty and stenting of the LAD followed by aortic valve replacement (AVR)

This combines two separate treatment episodes, when both the CABG and valve replacement can be carried out in one operation, with superior outcomes.

D	AVR and LAD bypass grafting using saphenous vein graft

Outcomes are slightly less good when a vein graft rather than a LIMA graft is employed.

E	Saphenous vein grafting followed by balloon valvotomy

Saphenous vein grafting is inferior to LIMA grafting, and balloon valvotomy is inferior to surgical valve replacement.

7428

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A 19-year-old university student presents with history of ingestion of 60 tablets of digoxin which he stole from his grandmother. On arrival his pulse rate is 44/min and regular, blood pressure 95/55 mmHg, no jugular venous distension, normal heart sounds and clear chest. He receives atropine 0.5 mg IV and his pulse rate increases to 58/min, with blood pressure improving to 105/60 mmHg. The patient is admitted to the coronary care unit, a nasogastric tube is placed and 75 g charcoal is administered through it.

Investigations:

Potassium	4.8 mmol/l
Sodium	139 mmol/l
Chloride	99 mmol/l
Bicarbonate	22 mmol/l
Creatinine	99 mol/l
Digoxin	10.5 nmol/l
ECG	Sinus bradycardia, 55/min

After 30 min the patient feels dizzy and heart rate drops to 35/min; another IV atropine 0.5 mg improves his heart rate to 55/min and symptoms resolve.

What is the most appropriate further treatment for this patient?

A	Isoproterenol infusion
B	Adrenaline infusion
C	Transcutaneous pacemaker
D	Temporary transvenous pacemaker
E	Digoxin-specific Fab fragment

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Calculator

Normal Values

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B Adrenaline infusion

C Transcutaneous pacemaker

D Temporary transvenous pacemaker

E Digoxin-specific Fab fragment

Explanation

E Digoxin-specific Fab fragment

This patient has symptomatic recurrent bradycardia because of digoxin toxicity. Although he has responded to atropine, Fab fragment should be administered to prevent recurrent bradycardia, as the effect of atropine will subside quickly. Given the digoxin level, there is also a very high risk of ventricular arrhythmias.

Indications for administration of digoxin-specific Fab fragment are:

- Haemodynamic instability
- Life-threatening arrhythmias
- Serum potassium >5 mmol/l in acute toxicity
- Plasma digoxin level >13 nmol/l
- Ingestion of >10 mg digoxin in adults and 4 mg in children
- Recurrent bradycardia.

A Isoproterenol infusion

Isoprenaline infusion is an option for symptomatic bradycardia, although in this case reversal of the effect of digoxin is the more appropriate intervention.

B Adrenaline infusion

Adrenaline infusion will elevate both blood pressure and heart rate, but runs a significant risk of ventricular arrhythmias.

C Transcutaneous pacemaker

Transcutaneous pacemaker is appropriate as an emergency intervention for bradycardia in the event that digoxin-specific Fab fragment antibodies are unavailable.

D Temporary transvenous pacemaker

Given the availability of digoxin-specific Fab fragments, these are preferred versus the delay and potential morbidity associated with pacemaker insertion. Pacemakers are also less effective in the context of digoxin overdose.

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Indications for administration of Digoxin specific Fab Fragment are:

- Haemodynamic instability
- Life-threatening arrhythmias
- Serum potassium >5 mmol/l in acute toxicity
- Plasma digoxin level >13nmol/l
- Ingestion of more than 10 mg digoxin in adults and 4 mg in children
- Recurrent bradycardia

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A 55 year old Indian male known to have ankylosing spondylitis is referred by his general practitioner for evaluation of a murmur. The patient has no history of chest pain, orthopnoea, paroxysmal nocturnal dyspnoea, pedal oedema or abdominal swelling. He is a lifelong non-smoker, has no family history of premature coronary artery disease and his lipid profile is normal. Apart from ankylosing spondylitis, he has no other past medical history of note. He takes no medications apart from occasional diclofenac for his back pain. Examination of the cardiovascular system reveals blood pressure 140/50 mmHg, bounding pulses at a rate of 88 beats/min, no jugular venous distension, apex beat at the 6th intercostal space that is diffuse and hyperdynamic, and a diastolic murmur at the left sternal edge. The lung fields are clear on auscultation and there is no pedal oedema.
An echocardiogram reveals severe aortic regurgitation (AR) and an ejection fraction (EF) of 45%.

What is the most appropriate management for this patient?

A	Start nifedipine and repeat echocardiography after 6 months
B	Start enalapril and repeat echocardiography after 6 months
C	Start enalapril and repeat echocardiography after 3 months
D	Start bisoprolol and repeat echocardiography after 3 months
E	Aortic valve replacement

7433

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Calculator

Normal Values

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D	Start bisoprolol and repeat echocardiography after 3 months
E	Aortic valve replacement

Explanation

E	Aortic valve replacement

All symptomatic patients with severe AR should have AVR. Asymptomatic patients with severe AR should also undergo AVR if they have depressed left ventricular (LV) function (ejection fraction (EF) <55%) or if they have severe LV dilatation (end-diastolic dimension >75 mm and end-systolic dimension >55 mm). Similarly patients with severe AR undergoing coronary artery bypass grafting or surgery on the aorta or any other valve should have AVR at the time of surgery.

A	Start nifedipine and repeat echocardiography after 6 months

Although vasodilators, including nifedipine, may be useful in the management of lesser degrees of AR, in severe disease a trial of nifedipine will not significantly improve symptoms.

B	Start enalapril and repeat echocardiography after 6 months

Although enalapril will have a positive impact on LV function and potentially reduce further valve deterioration, the patient has already reached the point where valve replacement is the only potential intervention.

C	Start enalapril and repeat echocardiography after 3 months

By this stage of valve deterioration, reducing pre-load with enalapril has little impact and delaying 3 months only prolongs the patient's symptoms whilst awaiting definitive intervention.

D	Start bisoprolol and repeat echocardiography after 3 months

Conventional teaching suggests that because beta blockade is not appropriate in the treatment of AR, this is best avoided here. Retrospective data do, however, suggest a mortality benefit associated with beta blockade, such that the contra-indication for beta blockade in AR may be challenged in the future.

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A 26-year-old male is referred by his general practitioner for an electrocardiogram (ECG) abnormality discovered on routine pre-employment check-up. The ECG reveals a prolonged QT interval (QTcF) of 0.52 s. The patient has no history of palpitations or syncope and has no family history of sudden cardiac death. The physical examination is unremarkable and blood chemistry shows normal levels of potassium and magnesium. The patient is not taking any drugs and leads a sedentary life. An exercise test does not reveal shortening of the QT interval with increased heart rate.

What is the best management for this patient?

A	Left stellate cardiac ganglionectomy
B	Atenolol 50 mg a day
C	Dual chamber pacemaker
D	Implantable cardioverter defibrillator (ICD)
E	Implantable cardioverter defibrillator (ICD) and atenolol

7434

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Calculator

Normal Values

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Explanation

B	Atenolol 50 mg a day

Beta blockers are the mainstay of therapy for asymptomatic, as well as symptomatic, patients with idiopathic long QT syndrome. Beta blockers decrease sympathetic activation from the left stellate ganglion (which drives QT prolongation). They also decrease the maximal heart rate achieved during exertion and thereby prevent exercise-related arrhythmic events that occur in long QT syndrome.

A	Left stellate cardiac ganglionectomy

Left stellate cardiac ganglionectomy is an invasive procedure and results in Horner syndrome. It is performed in patients who have symptoms despite beta blockers and have frequent shocks with ICD.

C	Dual chamber pacemaker

Dual-chamber pacing might be beneficial in the subset of patients with long QT syndrome type 3 (resulting from a mutation in the alpha subunit of the sodium channel).

D	Implantable cardioverter defibrillator (ICD)

An ICD isn't usually used as a single intervention in managing long QT syndrome, but may be implanted in conjunction with starting of beta blocker therapy in very high-risk patients.

E	Implantable cardioverter defibrillator (ICD) and atenolol

In a patient without history of collapse, atenolol as a single intervention is appropriate.

7434

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A 58-year-old female presents with history of fever of one week's duration associated with rhinorrhoea, headache and cough productive of yellowish sputum. The patient has had diabetes for 8 years complicated by painful peripheral neuropathy. Her present medications include gliclazide 40 mg twice daily, metformin 500 mg three times a day and amitriptyline 75 mg at bedtime. Physical examination reveals temperature 38°C, respiratory rate 18/min, blood pressure 110/70 mmHg, mild posterior pharynx erythema, tenderness over the maxillary sinus and fine inspiratory crackles at the right lung base.

Investigations show:

Chest X-ray	Infiltrates at right lower zone
White cell count	9 x 10^9/l
Haemoglobin	11 g/dl
Reticulocyte count	6%
Serum sodium	132 mmol/l
Serum potassium	4 mmol/l
Serum chloride	98 mmol/l
Serum bicarbonate	22 mmol/l
Serum bilirubin	40 mol/l

Which of the following drugs should be used to treat this patient?

A	Erythromycin
B	Levofloxacin
C	Amoxicilin/clavulanic acid
D	Doxycycline
E	Rifampicin

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Calculator

Normal Values

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Explanation

This patient has pneumonia and evidence of haemolysis (reticulocytosis and hyperbilirubinaemia). This suggests mycoplasma pneumoniae as a possible aetiological agent. Macrolides, fluoroquinolones like levofloxacin and doxycycline can all be used to treat mycoplasma. However, this patient is taking amitriptyline that can cause prolongation of the QT interval. Prescribing another agent that can also prolong the QT interval such as macrolides or levofloxacin can be hazardous. Hence doxycycline is the best therapy for this patient. Other antimicrobial agents that can cause prolongation of QT interval include:

- Pentamidine
- Spiramycin
- Chloroquine
- Halofantrine
- Mefloquine

Management of drug-induced long QT syndrome is to stop the precipitating drug, correction of any electrolyte disturbance like hypokalaemia or hypomagnesaemia, and treatment of associated ventricular arrhythmia. First-line pharmacological therapy for drug-induced long QT syndrome is intravenous magnesium sulphate 2 g administered as bolus over 1–2 min, followed by another bolus in 15 min if required, or continuous infusion at a rate of 5–20 mg/min.

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A 52-year-old accountant presents with history of pain in both calves. The pain starts after walking three blocks, is described as cramping and is relieved by rest. He is a known hypertensive for the last 10 years, on bisoprolol 10 mg a day. He has a 30-pack-year history of smoking but stopped 2 years ago. A treadmill exercise test done two years ago was normal. He does not have any other past medical history of note.
On physical examination he has BMI of 26, blood pressure of 125/75 mmHg, heart rate 75 beats/min, bilateral femoral bruits and absent dorsalis pedis pulses. Examination of the heart and respiratory system is normal.

Investigations:

Total cholesterol	5.5 mmol/l
LDL	3.5 mmol/l
HDL	1.2 mmol/l
Triglycerides	3.1 mmol/l

The patient is advised to continue bisoprolol 10 mg per day, and is also started on aspirin 75 mg per day, a low-fat diet and a supervised exercise training programme. On follow-up visit three months later his symptoms have improved and he is now able to walk five blocks without symptoms.

A repeat lipid profile shows:

Total cholesterol	5.0 mmol/l
LDL	3.2 mmol/l
HDL	1.3 mmol/l
Triglycerides	2.4 mmol/l

Which of the following is the next best step in this patient's management?

A	Start atorvastatin with a target LDL of less than 2.6 mmol/l
B	Stop atenolol
C	Start an ACE inhibitor aiming for a BP target of 120/70 mmHg
D	Start PRN GTN
E	Start simvastatin with a target LDL of <3.0 mmol/l

7437

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Calculator

Normal Values

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D	Start PRN GTN
E	Start simvastatin with a target LDL of <3.0 mmol/l

Explanation

A	Start atorvastatin with a target LDL of less than 2.6 mmol/l

Patients with peripheral arterial disease have an increased risk of adverse cardiovascular event and frequently have coexistent coronary and cerebrovascular atherosclerosis; therefore it is considered a coronary artery disease equivalent. The target LDL cholesterol in these patients is therefore <2.5 mmol/l. He also has significant hypertriglyceridaemia, and atorvastatin is more potent at lowering triglycerides than simvastatin.

B	Stop atenolol

Bisoprolol should not significantly impair walking capacity, and has a very favourable effect on risk of coronary artery disease.

C	Start an ACE inhibitor aiming for a BP target of 120/70 mmHg

Blood pressure is virtually at target there is likely to be limited additional impact by targeting a blood pressure of <120 mmHg systolic.

D	Start PRN GTN

This patient has predominantly peripheral vascular disease, where GTN has no significant impact.

E	Start simvastatin with a target LDL of <3.0 mmol/l

Given that this patient is a heavy smoker with peripheral vascular disease, a lower LDL target of <2.5 mmol/l is more appropriate.

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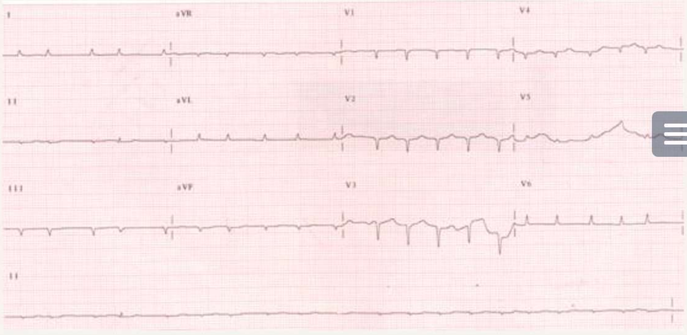
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A 55-year-old Nigerian male presents with a history of progressive swelling of his feet of 3 months' duration. He has also noticed gradually increasing abdominal distension. He has no history of chest pain, orthopnoea or paroxysmal nocturnal dyspnoea. He has been diabetic for the past 2 years, well controlled on metformin 850 mg twice daily. Physical examination reveals a pulse rate of 85/min, blood pressure 115/95 mmHg with a systolic postural drop of 20 mmHg and jugular venous distension. Heart sounds are normal and the chest is clear on auscultation. The liver edge is palpable 3 cm below the costal margin. There is bilateral pitting oedema up to the knees.

Investigations:

WCC	10×10^9/l
Hb	12.5 g/dl
PLT	165×10^9/l
Na^+	138 mmol/l
K^+	4.0 mmol/l
Creatinine	129 mmol/l
Albumin	3.8 mmol/l
Ca^{2+}	2.32 mmol/l
Chest X-ray	Normal cardiothoracic ratio and clear lung fields

The electrocardiogram (ECG) is shown below:



This shows mild dilatation of the atria, concentric left ventricular thickening, impaired diastolic relaxation and an ejection fraction of 55%.

Which of the following is the most likely diagnosis in this patient?

A	Cardiac amyloidosis
B	Haemochromatosis
C	Cardiac sarcoidosis
D	Diabetic nephropathy
E	Ischaemic cardiomyopathy

7447

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Normal Values

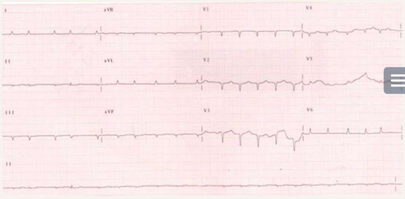
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B	Haemochromatosis
C	Cardiac sarcoidosis
D	Diabetic nephropathy
E	Ischaemic cardiomyopathy

Explanation

A	Cardiac amyloidosis

Cardiac amyloidosis most commonly presents as restrictive cardiomyopathy. The clinical findings are those of right heart failure, i.e. jugular venous distension and peripheral oedema, whereas orthopnoea and paroxysmal nocturnal dyspnoea are typically absent. In more advanced stages, systolic dysfunction also occurs. Postural hypotension can occur as a result of poor ventricular filling or associated autonomic neuropathy. The combination of low-voltage ECG and thickened ventricular walls is one of the characteristic features of cardiac amyloidosis. Other echocardiographic abnormalities include atrial dilatation, thickened interatrial septum, diastolic dysfunction and small-volume ventricles. The most distinctive feature of cardiac amyloidosis is a sparkling, granular appearance of the myocardium, but this is a relatively insensitive feature occurring only in about 25% of cases.

B	Haemochromatosis

Haemochromatosis can cause a restrictive cardiomyopathy, but the combination of ventricular wall thickness and low-voltage ECG makes the diagnosis of cardiac amyloidosis more likely. There are also no other features in the scenario to suggest haemochromatosis, and the condition is much rarer in patients of African origin.

C	Cardiac sarcoidosis

Like haemochromatosis, sarcoidosis is associated with a restrictive cardiomyopathy, although there is an absence of other features suggestive of sarcoidosis, including a dry cough or hypercalcaemia.

D	Diabetic nephropathy

Although this causes peripheral oedema, it wouldn't account for the ECG and ECHO findings seen here.

E	Ischaemic cardiomyopathy

There is no history of previous ischaemic heart disease to suggest a diagnosis of ischaemic cardiomyopathy.

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A 56-year-old male presents to the outpatient clinic for evaluation prior to his coronary angiography that is scheduled for the next day. The patient has had diabetes mellitus for 8 years and is currently taking metformin 500 mg three times per day and gliclazide 40 mg BD. He had suffered from recent onset of chest discomfort on exertion, and on a treadmill test was found to be positive for stress-induced ischaemia. He is currently taking clopidogrel 75 mg per day, atenolol 50 mg per day, indapamide 2.5 mg and fosinopril 10 mg per day. Physical examination reveals a pulse rate of 62 beats/min, blood pressure of 105/65 mmHg and jugular venous distension up to 2 cm above the sternal notch. The heart sounds are normal and chest is clear on auscultation. ECG reveals T-wave inversion in leads I and aVL.

Which of the following medications should be stopped for 24 h prior to his coronary angiography?

A	Metformin
B	Indapamide
C	Clopidogrel
D	Atenolol
E	Gliclazide

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A	Metformin
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D	Atenolol
E	Gliclazide

Explanation

A	Metformin

About 5% of patients undergoing cardiac catheterisation experience contrast-induced renal dysfunction. Patients with diabetes and prior renal dysfunction are at increased risk. Renal impairment increases the risk of accumulation of metformin and lactic acidosis. Therefore, metformin should be stopped prior to coronary angiography and reinstated 48 h after the procedure if renal function is found to be normal. Although recent data on acute angioplasty have not supported any risk associated with metformin therapy and angioplasty, the guidelines recommending cessation of therapy for elective angioplasty persist.

B	Indapamide

Although diuretics need not necessarily be discontinued, adequate hydration is essential before angiography.

C	Clopidogrel

Aspirin and clopidogrel are important adjuncts to any percutaneous coronary intervention that might be done during coronary angiography.

D	Atenolol

Myocardial oxygen demand may increase at the time of elective angiography, and atenolol can reduce the risk of peri-procedural ischaemia.

E	Gliclazide

Although continuing the gliclazide may increase the risk of hypoglycaemia, as long as the patient is eating it need not be discontinued.

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Contrast-induced nephropathy following angiography and cardiac interventi...
heart.bmj.com/content/early/2016/02/08/heartjnl-2014-306962

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A 45-year-old male was diagnosed with idiopathic dilated cardiomyopathy 8 years ago. Two months ago he was admitted with decompensated congestive heart failure (CHF) and echocardiogram performed at that time revealed an ejection fraction of 20%. He was discharged on furosemide 60 mg in morning and 40 mg in evening, enalapril 10 mg twice daily and digoxin 0.125 mg/day.

He now presents to the emergency department with progressively increasing swelling of the lower limbs and shortness of breath over one week. He has blood pressure of 130/95mmHg, heart rate of 105/minute, jugular venous distension, a third heart sound gallop and diffuse crackles all over the chest. He improves after receiving morphine 5 mg and two boluses of furosemide 60 mg intravenously. Electrocardiogram (ECG) reveals sinus tachycardia. He is admitted under cardiology service.

Blood drawn in emergency for electrolytes shows:

Serum sodium	122 mmol/l
Serum chloride	92 mmol/l
Serum creatinine	130 mmol/l
Serum bicarbonate	21mmol/l
Serum potassium	3.7mmol/l

Which of the following is most appropriate step in correcting this patient's hyponatraemia?

A	Restrict water intake to 1 l per day
B	Stop furosemide until serum sodium is above 128 mmol/day
C	Administer hypertonic saline 30 ml/h
D	Start lithium 100 mg three times a day
E	Administer normal saline 50 ml/h

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Explanation

Hyponatraemia is a frequent finding in patients with advanced heart failure and is associated with poor outcomes. Patients with congestive heart failure (CHF) have decreased cardiac output and effective blood circulating volume. This results in activation of the renin–angiotensin system and release of antidiuretic hormone (ADH) and subsequent failure of excretion of ingested water.

Water restriction is the first-line and mainstay of therapy in hyponatraemic patients with CHF. Stopping furosemide will not be possible for a patient who has decompensated heart failure. Similarly, administration of hypertonic saline is only indicated if there is neurological manifestation of hyponatremia. Moreover hypertonic or isotonic saline administration will be poorly tolerated in a volume-overloaded patient. Lithium can inhibit the action of ADH, but has slow onset of action and numerous central nervous system and cardiotoxic effects.

7449

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A 45-year-old female presents with history of severe retrosternal chest pain of one day's duration. The pain radiates to the back and left shoulder and increases with inspiration, coughing and changes in body posture. On examination her blood pressure is 105/8 5 mmHg, heart rate 110/min, respiratory rate 22/min and temperature 38.1°C. Heart sounds are normal and a friction rub is heard during expiration. ECG reveals ST segment elevation in both limb and chest leads and ST segment depression in aVR. She has a WCC of 14,000/ml with left shift and erythrocyte sedimentation rate of 55 mm in the first hour. ECG is unremarkable. She responds well over the next few days to ibuprofen 800 mg four times per day and is discharged home. She presents 5 months later with low-grade fever and chest pain. She describes similar symptoms 3 months after the initial episode that responded to ibuprofen which she self-administered. She is started on ibuprofen again and work-up for autoimmune screening is requested, which turns out to be negative. However, despite 7 days' therapy with ibuprofen, she experiences bouts of chest pain.

What is the next step recommended in the management of this patient?

A	Pericardial biopsy
B	Prednisolone
C	Pericardectomy
D	Colchicine
E	Cyclosporin

7450

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Explanation

D	Colchicine

Between 15 and 30% of patients with apparently idiopathic acute pericarditis may have recurrent attacks, and this is considered to be an autoimmune phenomenon. Colchicine is useful both in acute episode and to prevent recurrence of pericarditis.

A	Pericardial biopsy

Pericardial biopsy in patients with recurrent pericarditis without effusion is unlikely to be revealing and is not needed.

B	Prednisolone

Prednisolone can be considered in patients who fail to respond to non-steroidal anti-inflammatory drug and colchicine therapy. It is reserved for patients who fail to respond to initial intervention because of the adverse effects of

C	Pericardectomy

Pericardectomy is only indicated for recurrent pericarditis once medical interventions have failed.

E	Cyclosporin

Cyclosporine is used in the treatment of recurrent pericarditis post-transplant, but colchicine is preferred as a first-line agent in the non-transplant setting.

7450

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A 38-year-old male has been found to have elevated blood pressure (BP) on several occasions over the last three months. His systolic BP has been around 155 mmHg and diastolic 95 mmHg. He has 5-pack-year history of smoking and consumes 3-4 units of alcohol per day. He has no personal or family history of coronary artery disease, stroke or diabetes. His weight is 93 kg and height 162 cm, and the rest of physical examination is unremarkable. His electrocardiogram (ECG) and chest X-ray are normal.

Investigations:

Cholesterol	5.2 mmol/l
High-density lipoprotein	1 mmol/l
Triglycerides	2.9 mmol/l
Sodium	140 mmol/l
Potassium	4.1 mmol/l
Bicarbonate	26 mmol/l
Chloride	104 mmol/l
Creatinine	93 mmol/l

You have advised him about lifestyle modification.

Which of the following lifestyle modifications will produce the most reduction in BP?

A	Weight reduction to 83 kg
B	Diet rich in fruits and vegetables and low in fat
C	Moderation of alcohol consumption
D	Reduce dietary sodium to less than 6 g/day
E	Regular exercise without significant weight reduction

7452

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Explanation

A	Weight reduction to 83 kg

This patient has mild hypertension (systolic BP 140–159 mmHg, diastolic BP 90–99 mmHg) and has no evidence of target organ damage. The British Hypertensive Society does not recommend starting antihypertensive therapy in such patients, but lifestyle modifications should be encouraged. Of all the lifestyle modifications described, weight reduction produces the greatest reduction in BP. A 10 kg weight loss is expected to decrease BP by 15–20 mmHg; the effect of other lifestyle modifications on hypertension, as mentioned in the other options, is less than this.

B	Diet rich in fruits and vegetables and low in fat

This will only reduce the blood pressure by 8–14 mm Hg.

C	Moderation of alcohol consumption

This is defined as less than 21 units a week for man and less than 14 units a week for women. It will only reduce the blood pressure by 2.5–4.0 mmHg.

D	Reduce dietary sodium to less than 6 g/day

This measure will only reduce the blood pressure by 2–8 mmHg.

E	Regular exercise without significant weight reduction

This measure will only reduce the blood pressure by 4–9 mmHg.

7452

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A 75-year-old retired accountant is on warfarin 4 mg per day, which was started a year ago when he had a stroke and was found to have chronic atrial fibrillation. His only other medication is amlodipine 10 mg per day for isolated systolic hypertension. He now presents with a history of minor gum bleeding of one day's duration. On examination he appears well and has a blood pressure of 165/85 mmHg with no postural drop, a pulse rate of 73/min and respiratory rate of 18/min. The rest of his physical examination is unremarkable except for mild right-sided hemiparesis.

Investigations:

Sodium	135 mmol/l
Potassium	4.5 mmol/l
Urea	10 mmol/l
Creatinine	70 mol/l
International normalised ratio (INR)	9
Dipstick urine	2+ blood

What is the most appropriate next step in the management of this patient?

A	Stop warfarin and administer fresh-frozen plasma 10 ml/kg
B	Stop warfarin and administer phytomenadione (vitamin K1) 5 mg IV
C	Stop warfarin and administer phytomenadione 1 mg IV
D	Stop warfarin and administer prothrombin complex concentrate
E	Stop warfarin and restart when the INR is less than 5

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Explanation

C	Stop warfarin and administer phytomenadione 1 mg IV

The *British National Formulary (BNF)* recommends that patients with minor or no bleeding with an international normalised ratio (INR) above 8 should have their warfarin stopped and restarted when the INR is below 5. However, for patients who are at increased risk of bleeding, it recommends phytomenadione to be administered 5 mg orally or 1-3 mg by slow IV injection. IV administration is recommended because it is not subject to the variance seen with oral absorption, and will achieve reversal more rapidly.

A repeat dose of phytomenadione can be given if the INR remains too high after 24 h.

A	Stop warfarin and administer fresh-frozen plasma 10 ml/kg

Fresh frozen plasma is used for emergent reversal of warfarin overdose - for example, patients who are suffering from life-threatening bleeding, such as an actively bleeding peptic ulcer with high INR.

B	Stop warfarin and administer phytomenadione (vitamin K1) 5 mg IV

For patients who are at increased risk of bleeding, BNF recommends that phytomenadione be administered 5 mg orally or 1-3 mg by slow IV injection - not 5 mg IV.

D	Stop warfarin and administer prothrombin complex concentrate

Prothrombin complex concentrate is reserved for cases of life-threatening bleeding, otherwise giving phytomenadione and stopping warfarin is sufficient.

E	Stop warfarin and restart when the INR is less than 5

The patient is still at risk of bleeding with high INR, and therefore a reversal treatment is required, such as phytomenadione, instead of just stopping warfarin. Risk factors that put a patient at increased risk of bleeding with warfarin therapy include:

- age above 70 years
- hypertension particularly if systolic BP is above 160 mmHg
- previous history of stroke
- increased intensity of anticoagulation (INR >3)
- combination therapy with warfarin and aspirin.

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A 55-year-old baker presents for evaluation of retrosternal chest pain on exertion of one month's duration. He is a known hypertensive and is taking atenolol 50 mg daily. He has 10 pack-year history of smoking. His electrocardiogram (ECG) at rest reveals left ventricular hypertrophy with strain pattern. Lipid profile and chest X-ray are normal. He subsequently undergoes thallium stress test that shows reversible ischaemia in the territory of the left anterior descending artery (LAD). He is commenced on aspirin and clopidogrel and he undergoes stenting of a mid-LAD lesion. On follow-up appointment 4 weeks later in clinic, he is well and asymptomatic. However, his blood pressure is 135/85 mmHg.

What is the target blood pressure for this patient according to British Hypertensive Society guidelines?

A	Less than 140/90 mmHg
B	Less than 130/80 mmHg
C	Less than 120/80 mmHg
D	Less than 135/85 mmHg
E	Less than 150/90 mmHg

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D	Less than 135/85 mmHg
E	Less than 150/90 mmHg

Explanation

Recommendations for target blood pressure (BP) differ slightly among different guidelines. British Hypertension Society Guidelines for Hypertension Management (BHS-IV) recommend a goal BP of less than 130/80 mmHg for patients with diabetes, renal impairment and established cardiovascular disease; while a Joint Negotiating Committee (JNC) 8 report and American College of Cardiology/American Heart Association Guidelines recommend a target BP of less than 140/90 mmHg in non-diabetic patients with cardiovascular disease.

7455

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A 48-year-old postmenopausal women presents with a history of severe retrosternal chest pain of two hours' duration. Electrocardiogram (ECG) reveals ST segment depression in leads I, II and aVF. Serial cardiac markers show elevated creatine kinase and cardiac troponin T. She is treated with aspirin, clopidogrel, intravenous heparin infusion and beta-blockers. She undergoes coronary angiography 48 h later that shows a mid-right coronary artery stenosis, which is stented. Two weeks later she notices gum bleeding after brushing her teeth. The next day she is found in her room confused and absence of spontaneous movements of the right arm and leg are noticed. On arrival at the emergency department she has a pulse rate of 100 beats/min, respiratory rate of 18/min, blood pressure of 110/6 0mmHg and temperature of 38.2°C. She is confused and has right-sided hemiparesis. An emergency brain CT excludes the presence of haemorrhage.

Laboratory tests show:

Haemoglobin	9.2 g/dl
White cell count	18×10^9/l
Platelets	40×10^9/l
Serum sodium	139 mmol/l
Serum potassium	5 mmol/l
Serum bicarbonate	20 mmol/l
Serum creatinine	152 μ mol/l
Serum chloride	98 mmol/l

Which of the following investigations will be most useful to establish the underlying cause of her symptoms?

A	Cerebral angiography
B	Lumbar puncture
C	Peripheral blood film
D	Coombs' test
E	Bleeding time

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Explanation

This patient has developed fever, altered mental status, right hemiparesis, anaemia, thrombocytopenia and renal impairment 2 weeks after being started on clopidogrel. The most likely diagnosis is thrombotic thrombocytopenic purpura (TTP). This disorder can occur in less than 1% of patients receiving clopidogrel or ticlodipine. The peripheral blood film reveals fragmented RBCs (schistocytes, eg, spherocytes, segmented RBCs, burr cells, or helmet cells). While further imaging with MRI would certainly be indicated, cerebral angiography would not be performed here as a next step, and in any case the low platelet count would give cause for caution with invasive procedures including lumbar puncture. Other side-effects reported with use of clopidogrel are rash, urticaria, pruritis and gastrointestinal upset.

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A 54-year-old Indian immigrant presents to the emergency department with rapidly progressive dyspnoea of 3 h duration. He is a known hypertensive, on atenolol 50 mg per day, and hyperlipidaemic, on simvastatin 20 mg per day and has type 2 diabetes for which he takes metformin and glicazide. The patient states that he had a similar episode in India 4 months ago. On examination he appears breathless and is using the accessory muscles of respiration. His blood pressure is 185/110 mmHg, heart rate 114/min and respiratory rate 28/min. He has raised jugular venous pressure (JVP), summation gallop and inspiratory crackles all over the chest.

Investigations:

Electrocardiogram (ECG)	Sinus tachycardia with left ventricular hypertrophy and strain pattern, antero-lateral ST segment depression
Chest X-ray	Bilateral pulmonary venous congestion
pH	7.38
$p(CO_2)$	4.5 kPa
$p(O_2)$	10 kPa
O_2 saturation	93%
White cell count	14×10^9/l
Haemoglobin	12 g/dl
Platelets	188×10^9/l
Na^+	138 mmol/l
K^+	4.5 mmol/l
Creatinine	112 micromol/l

What is the most likely cause of this patient's symptoms?

A	Acute aortic regurgitation
B	Bilateral renal artery stenosis
C	Myocardial ischaemia
D	Community-acquired pneumonia
E	Pulmonary embolism

7457

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B Bilateral renal artery stenosis

C Myocardial ischaemia

D Community-acquired pneumonia

E Pulmonary embolism

Explanation

C Myocardial ischaemia

This patient has presented with rapidly worsening dyspnoea and clinical findings namely, tachycardia, raised jugular venous pressure (JVP), gallop rhythm and inspiratory crackles, which suggest acute pulmonary oedema. Rapidly developing pulmonary congestion, as in this patient, is also termed flash pulmonary oedema. The most common cause of flash pulmonary oedema is myocardial ischaemia. He has three risk factors for coronary artery disease - hypertension, high cholesterol and diabetes - and therefore he should be evaluated for it.

A Acute aortic regurgitation

Aortic regurgitation can cause acute heart failure with flash pulmonary oedema, but is rare. There is no history to suggest the presence of aortic regurgitation. The echocardiographic findings do not include a regurgitant aortic valve.

B Bilateral renal artery stenosis

Bilateral renal artery stenosis can also present with a similar clinical picture but is a less common cause of flash pulmonary oedema. We would expect difficult-to-treat hypertension and different-sized kidneys on abdominal ultrasound in bilateral renal artery stenosis.

D Community-acquired pneumonia

Clinical findings are not in favour of community-acquired pneumonia. Typical findings we would expect include a fever, raised white cell count, crepitations in one lung lobe and JVP would not be raised.

E Pulmonary embolism

Clinical findings are not in favour of pulmonary embolism. Typical findings we would expect include haemoptysis and pleuritic chest pain. There may be signs of risk factors such as swollen calves to suggest deep vein thrombosis.

7457

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A 65-year-old female, with known chronic obstructive pulmonary disease, presents with a history of progressive shortness of breath of one week's duration. She frequently gets up at night coughing and short of breath. She has been expectorating whitish sputum over the last two days. On examination she has temperature of 37.1°C, blood pressure of 135/85 mmHg, pulse rate of 110/min and respiratory rate of 26/min. She has raised jugular venous pressure and normal heart sounds. Examination of lung fields reveals fine inspiratory crackles at both bases.

Investigations:

Sodium	135 mmol/l
Potassium	4.5 mmol/l
Urea	8 mmol/l
Creatinine	120 mol/l
Echocardiogram (3 months ago)	Dilated cardiomyopathy with ejection fraction of 32%
Chest X-ray	Borderline cardiomegaly and increased interstitial markings

Which of the following investigations will help clarify whether heart failure or COPD is contributing more to her symptoms at present?

A	Ventilation–perfusion scan
B	Spiral computed tomography of the chest
C	Sputum Gram stain and culture
D	Transthoracic echocardiography
E	Serial B-type atrial natriuretic peptide (BNP) measurements

7458

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Calculator

Normal Values

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A 65-year-old female, with known chronic obstructive pulmonary disease, presents with a history of progressive shortness of breath of one week's duration. She frequently gets up at night coughing and short of breath. She has been expectorating whitish sputum over the last two days. On examination she has temperature of 37.1ºC, blood pressure of 135/85 mmHg, pulse rate of 110/min and respiratory rate of 26/min. She has raised jugular venous pressure and normal heart sounds. Examination of lung fields reveals fine inspiratory crackles at both bases.

Investigations:

Sodium	135 mmol/l
Potassium	4.5 mmol/l
Urea	8 mmol/l
Creatinine	120 mol/l
Echocardiogram (3 months ago)	Dilated cardiomyopathy with ejection fraction of 32%
Chest X-ray	Borderline cardiomegaly and increased interstitial markings

Which of the following investigations will help clarify whether heart failure or COPD is contributing more to her symptoms at present?

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E	Serial B-type atrial natriuretic peptide (BNP) measurements

Explanation

E	Serial B-type atrial natriuretic peptide (BNP) measurements

This patient's dyspnoea might be either secondary to heart failure or exacerbation of her chronic pulmonary obstructive disease. The measurement of BNP in this case is helpful to establish the cause of dyspnoea. Plasma BNP levels have been reported to be elevated in patients with pulmonary disease and whose symptoms were secondary to heart failure, and vice versa. Values of less than 100 pg/ml make heart failure unlikely, while values of more than 400 pg/ml are strongly suggestive of heart failure as the cause of dyspnoea. Her BNP is of course likely to be above the upper limit of normal when she is relatively well, but the level of elevation may be useful in elucidating the cause of her symptom exacerbation.

A	Ventilation–perfusion scan

Spiral computed tomography may be useful to identify pulmonary embolism, but the clinical picture is not suggestive of pulmonary embolism in this scenario. Typical findings we would expect include haemoptysis and pleuritic chest pain.

B	Spiral computed tomography of the chest

. The clinical picture is not suggestive of pneumonia. Typical findings we would expect include a fever, raised white cell count, crepitations in one lung lobe and productive cough.

C	Sputum Gram stain and culture

The clinical picture is not suggestive of pneumonia. Typical findings we would expect include a fever, raised white cell count, crepitations in one lung lobe and productive cough.

D	Transthoracic echocardiography

The clinical picture is not suggestive of pulmonary embolism. Typical findings we would expect include haemoptysis and pleuritic chest pain. There may be signs of risk factors such as swollen calves to suggest deep vein thrombosis.

7458

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A 55-year-old female is admitted to hospital for the second time in two months with exacerbation of dyspnoea and peripheral oedema. She is known to have dilated cardiomyopathy, and echocardiography performed on previous admission revealed an ejection fraction of 25% and moderate mitral and tricuspid regurgitation. Her heart failure regimen includes furosemide 60 mg twice daily, digoxin 0.25 mg/day, enalapril 15 mg twice daily, carvedilol 12.5 mg twice daily and spironolactone 50 mg/day. She has type 2 diabetes mellitus maintained on pioglitazone 15 mg twice daily. However, she had poor glycaemic control and was started on insulin lente 15 units twice daily and insulin lispro 5 units twice daily. Physical examination reveals blood pressure of 105/75 mmHg, pulse rate of 90/min and respiratory rate of 25/min. She has jugular venous distension, bilateral inspiratory crackles halfway up the lung fields and pitting oedema up to the knees. She improves on intravenous diuretics over the next three days.

Investigations:

Sodium	135 mmol/l
Potassium	4.5 mmol/l
Urea	8 mmol/l
Creatinine	120 mol/l
Glucose (random)	13 mmol/l
Electrocardiogram (ECG)	Sinus tachycardia and poor R-wave progression in chest leads

What change in her regular medications should be made to decrease recurrent exacerbations of heart failure?

A	Add hydrochlorothiazide
B	Decrease the dose of carvedilol to 6.25 mg twice daily
C	Discontinue pioglitazone
D	Stop carvedilol
E	Start warfarin 5 mg per day

7460

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Calculator

Normal Values

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D	Stop carvedilol
E	Start warfarin 5 mg per day

Explanation

C Discontinue pioglitazone

Thiozolidinediones can cause fluid retention and precipitate heart failure. Therefore, pioglitazone should be avoided in patients with symptomatic heart failure, especially those with New York Heart Association Class III and IV. Metformin should also be avoided in heart failure patients who require drug therapy because of increased risk of lactic acidosis.

Other drugs that should be avoided in heart failure include non-steroidal anti-inflammatory agents, cilostazol and sildenafil.

A Add hydrochlorothiazide

Hydrochlorothiazide may be added if oedema is resistant to loop diuretics, but in this case the heart failure exacerbation has responded well so that it is not required.

B Decrease the dose of carvedilol to 6.25 mg twice daily

There is no need to reduce the dose of carvedilol, as it improves morbidity and mortality in heart failure. It can cause fluid retention when initiated, but this should be managed by increasing the dose of diuretics.

D Stop carvedilol

There is no need to discontinue carvedilol, as it improves morbidity and mortality in heart failure. It can cause fluid retention when initiated, but this should be managed by increasing the dose of diuretics.

E Start warfarin 5 mg per day

In some patients, warfarin may be advocated in severe cardiomyopathy to prevent pulmonary embolism. However, it will not prevent recurrent heart failure episodes.

7460

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A 52-year-old male presents with a history of intermittent chest pain of three months' duration. The pain is perceived as a burning sensation, at times associated with epigastric fullness. It responds partially to antacids and for the last 10 days he has been taking lansoprazole 30 mg per day, but the frequency of chest pain has not decreased. He says it also sometimes comes on after exercise. The patient is a known hypertensive on indapamide 1.5 mg per day. He is a lifelong non-smoker and has no family history of premature coronary artery disease. A lipid profile checked a year ago was normal. His body mass index is 29. He has blood pressure of 140/85 mmHg, pulse rate of 88/min and respiratory rate of 12/min; examination of the cardiovascular system is normal.

Investigations:

Sodium	135 mmol/l
Potassium	4.5 mmol/l
Urea	8 mmol/l
Creatinine	120 mol/l
Haemoglobin	14 g/dl
White cell count	10 x 10^9/l
Cardiac markers	Normal
Chest X-ray	Normal
Electrocardiogram (ECG)	Right bundle branch block (also seen in ECGs performed a year ago).

What is the next best step in the evaluation of this patient?

A	24 h oesophageal PH monitoring
B	Thallium myocardial perfusion imaging
C	Dobutamine stress echocardiography
D	Exercise electrocardiography
E	Oesophagoscopy

7461

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Normal Values

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C	Dobutamine stress echocardiography
D	Exercise electrocardiography
E	Oesophagoscopy

Explanation

B Thallium myocardial perfusion imaging

This patient has an intermediate likelihood of coronary artery disease (CAD. His chest pain is atypical but as he is above 40 years and is hypertensive, he should be evaluated for coronary artery disease. Because exercise electrocardiography is not useful in this patient (see below), myocardial perfusion imaging is the preferred modality for evaluation of CAD. This patient has right bundle branch block. Exercise-induced ST segment depression in leads V_1 to V_4 is common in these patients, even in the absence of myocardial ischaemia. This reduces the specificity of stress electrocardiography as a diagnostic tool in such patients. Pharmacological stressors such as dobutamine or thallium can be used for myocardial perfusion. When comparing dobutamine stress versus thallium scanning, thallium has greater sensitivity, versus greater specificity for dobutamine with respect to coronary artery disease. As such, in this case with intermediate-likelihood CAD, thallium is the preferred option rather than dobutamine stress echocardiography. You may like to refer to the reference below for further information.

A 24 h oesophageal PH monitoring

This patient might have gastro-oesophageal reflux disease; however, 24 h oesophageal pH monitoring cannot determine whether the symptoms are definitely caused by reflux or by myocardial ischaemia.

C Dobutamine stress echocardiography

Pharmacological stress in the form of dobutamine can be used in patients who are unable to exercise because of stroke, peripheral vascular disease or arthritis, although it should be avoided in WPW syndrome, patients with conduction abnormalities and those with ischaemia on resting ECG. When comparing dobutamine stress versus thallium scanning, thallium has greater sensitivity, versus greater specificity for dobutamine with respect to coronary artery disease. As such, in this case with intermediate-likelihood CAD, thallium is the preferred option rather than dobutamine stress echocardiography.

D Exercise electrocardiography

Exercise electrocardiography is not useful in patients with any of the following:

- conduction abnormalities
- resting electrocardiogram (ECG) abnormalities such as ST-segment depression of >1 mm
- Wolff–Parkinson–White syndrome
- those taking digitalis
- those with ventricular paced rhythm.

E Oesophagoscopy

This patient might have gastro-oesophageal reflux disease; however, oesophagoscopy cannot determine whether the symptoms are definitely caused by reflux or by myocardial ischaemia.

7461

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Responses Total:	5
Responses - % Correct:	0%

External Links

Noninvasive evaluation of ischaemic heart disease
eurheartj.oxfordjournals.org/content/ehj/24/9/789.full.pdf

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A 27-year-old female in the 12th week of pregnancy is referred for evaluation of progressively worsening exercise intolerance, fatigue and dyspnoea. On physical examination she has a respiratory rate of 20/min, blood pressure 120/90 mmHg and pulse rate of 91/min. She has jugular venous distension, left parasternal heave, loud pulmonary component of the second heart sound, a pan-systolic murmur at the left sternal border and pedal oedema up to the knees.

Investigations:

White cell count	8 × 109/l
Haemoglobin	16.7 g/dl
Platelets	150 × 10^9/l
Electrocardiogram (ECG)	Right atrial and right ventricular hypertrophy
Lung perfusion scintigraphy	No perfusion defects
Pulmonary function test	Mild restrictive defect and moderate decrease in diffusion capacity of carbon monooxide
Echocardiography:	Severe pulmonary hypertension with right ventricular systolic pressure of 80 mmHg and tricuspid regurgitation

Intravenous injection of microbubbles does not show any intracardiac shunting.

Which of the following is most appropriate management step in this patient?

A	Heparin, bosentan and Caesarean section at 32 weeks of pregnancy
B	Heparin, furosemide and Caesarean section at 32 weeks of pregnancy
C	Warfarin, bosentan and induction of labour at 32 weeks of pregnancy
D	Warfarin, furosemide and Caesarean section at 32 weeks of pregnancy
E	Point out the risks to her own health of continuing with the pregnancy

7462

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Calculator

Normal Values

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D	Warfarin, furosemide and Caesarean section at 32 weeks of pregnancy
E	Point out the risks to her own health of continuing with the pregnancy

Explanation

E	Point out the risks to her own health of continuing with the pregnancy

This patient has primary pulmonary hypertension (PPH). Severe pulmonary hypertension in pregnancy has a high mortality, approaching 50%, and therefore this patient should be advised about this risk versus considering a termination. Patients who opt against termination of pregnancy should be closely followed up and managed with anticoagulation, oxygen and pulmonary vasodilator therapy such as prostacyclin. The patient should be advised regarding contraception in future, but oral contraceptive pills should not be used for possible increased risk of thrombo-embolism.

A	Heparin, bosentan and Caesarean section at 32 weeks of pregnancy

Bosentan is teratogenic and should not be used in pregnancy.

B	Heparin, furosemide and Caesarean section at 32 weeks of pregnancy

The use of frusemide during pregnancy should be avoided because placental perfusion can be reduced, and therefore there is a need for fetal growth monitoring if frusemide is used. It is contraindicated in breast feeding as it passes into the breast milk and may inhibit lactation.

C	Warfarin, bosentan and induction of labour at 32 weeks of pregnancy

Bosentan is teratogenic and should not be used in pregnancy.

D	Warfarin, furosemide and Caesarean section at 32 weeks of pregnancy

The use of frusemide during pregnancy should be avoided because placental perfusion can be reduced, and therefore there is a need for fetal growth monitoring if frusemide is used. It is contraindicated in breast feeding as it passes into the breast milk and may inhibit lactation.

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Responses Total:	6
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A 68-year-old male with ischaemic cardiomyopathy presents with worsening effort tolerance of 3 months' duration. He becomes short of breath even after mild exertion. Five years ago he had an anterior myocardial infarction. Coronary angiography at that time showed three-vessel disease, and he underwent coronary artery bypass grafting. His last echocardiography two months ago showed an ejection fraction of 20%. His current medications are: aspirin 75 mg, digoxin 125 mcg, furosemide 60 mg twice daily, lisinopril 10 mg/day, metoprolol 50 mg twice daily, simvastatin 20 mg/day and lansoprazole 30 mg daily. Physical examination reveals a blood pressure of 105/65 mmHg, pulse 68/min, mild jugular venous distension, fine bibasal crepitations and mild pedal oedema.

Investigations:

White blood cells	8.0×10^9/l
Haemoglobin	13.1 g/dl
Sodium	132 mmol/l (135–145 mmol/l)
Potassium	5.3 mmol/l (3.5–5 mmol/l)
Chloride	92 mmol/l (97–110 mmol/l)
Bicarbonate	26 mmol/l (22–28 mmol/l)
Creatinine	110 µmol/l (18–106 µmol/l)
Electrocardiogram (ECG)	QRS > 120ms. Left bundle branch block (LBBB)

Which of the following interventions would be most likely to improve the patient's symptoms?

A	Hydralazine and isosorbide dinitrate
B	Biventricular pacing
C	Increase digoxin to 250 mcg/day
D	Spironolactone
E	Warfarin

7464

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Calculator

Normal Values

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B Biventricular pacing

C Increase digoxin to 250 mcg/day

D Spironolactone

E Warfarin

Explanation

B Biventricular pacing

Bundle branch blocks or intraventricular conduction delay (IVCD cause ventricular dys-synchrony and reduce the cardiac contractile function. This leads to worsening of heart failure symptoms. Such patients have poorer exercise tolerance and worse prognosis compared to patients with normal sinus rhythm. Cardiac resynchronisation therapy by biventricular pacing improves left ventricular contractile function in patients with left bundle branch block (LBBB or IVCD, and thus improves symptoms. National Institute for Health and Care Excellence (NICE) guidelines recommend that cardiac resynchronisation therapy should be considered in patients with left ventricular ejection fraction less than 35%, drug-refractory symptoms and QRS duration >120 ms.

A Hydralazine and isosorbide dinitrate

Hydralazine and nitrates in combination are recommended in patients who do not tolerate angiotensin-converting enzyme inhibitors.

C Increase digoxin to 250 mcg/day

Increasing serum digoxin in this patient, who has slightly raised serum creatinine, can lead to digoxin toxicity and is unlikely to improve symptoms.

D Spironolactone

Spironolactone has been shown to decrease hospitalisation and improve survival in patients with severe heart failure; however, this patient's serum potassium level is slightly higher than normal, and adding spironolactone in such cases can further increase the serum potassium to dangerous levels. That said, if there was no bundle branch block it would be an avenue worth exploring with regular U&E monitoring.

E Warfarin

Patients with cardiomyopathy are at high risk of thromboembolism; warfarin may be prescribed to prevent systemic embolization, but it would be unlikely to improve this patient's symptoms because there is no indication that there is embolism. We would expect tachycardia, tachypnoea and pleuritic chest pain if pleural embolism was present.

7464

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Responses Total:	7
Responses - % Correct:	0%

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A 72-year-old male presents with a history of passage of two black tarry stools over the last day. He is known to have idiopathic dilated cardiomyopathy and his current medications include lisinopril 20 mg/day, furosemide 40 mg twice daily, carvedilol 12.5 mg twice daily and warfarin 3 mg/day. He has never had any rhythm disturbances, stroke or history of venous or arterial thromboembolism. He has not used any painkillers recently, but admits to drinking 5-8 pints of beer per day. Other recent history includes two admissions to the casualty unit after falls. His last echocardiography 3 months ago revealed global hypokinesia and an ejection fraction of 18%. Physical examination shows blood pressure 98/48 mmHg, pulse 110/min and respiratory rate 18/min. There is no jugular venous distension, and lung fields are clear to auscultation. Per rectal examination reveals black stool.

Investigations:

Hb	11 g/dl
Platelets	155 × 10^9/l
International normalised ratio (INR)	2.8
Electrocardiogram (ECG)	Sinus tachycardia
Chest X-ray	Cardiomegaly with clear lung fields

He is administered intravenous fluids, vitamin K and fresh-frozen plasma. An upper gastrointestinal endoscopy shows a clean-based duodenal ulcer and no active bleeding. Biopsy specimen for Helicobacter pylori is positive. The patient recovers well and is begun on eradication therapy for H. pylori.

What is the most appropriate step in managing the anticoagulation in this patient?

A	Restart warfarin therapy after confirming eradication of *H. pylori* with a target INR of 1.5-2.0
B	Restart warfarin therapy after one month with a target INR of 1.5 to 2
C	Restart warfarin therapy after one month with a target INR of 2-3
D	Restart warfarin therapy after confirming eradication of *H. pylori* with a target INR 2-3
E	Do not restart warfarin

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Calculator

Normal Values

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D	Restart warfarin therapy after confirming eradication of *H. pylori* with a target INR 2-3
E	Do not restart warfarin

Explanation

E	Do not restart warfarin

The objective of this question is to know the indications of anticoagulation in patients with heart failure. Anticoagulation should be considered for patients with heart failure and a low ejection fraction, particularly in those who have any of the following:

- A previous thromboembolic event
- Intracardiac thrombus
- Lleft ventricular aneurysm

He does, however, admit to relatively significant alcohol use, and two admissions to the casualty unit with falls, and therefore the benefit risk profile of warfarin use means it is probably not appropriate to continue therapy in this case, although the falls themselves may have been related to LV dysfunction/rhythm disturbance.

A	Restart warfarin therapy after confirming eradication of *H. pylori* with a target INR of 1.5-2.0

Due to the alcohol use and recurrent falls, restarting warfarin is high risk in this scenario.

B	Restart warfarin therapy after one month with a target INR of 1.5 to 2

Due to the alcohol use and recurrent falls, restarting warfarin is high risk in this scenario.

C	Restart warfarin therapy after one month with a target INR of 2-3

Due to the alcohol use and recurrent falls, restarting warfarin is high risk in this scenario.

D	Restart warfarin therapy after confirming eradication of *H. pylori* with a target INR 2-3

Due to the alcohol use and recurrent falls, restarting warfarin is high risk in this scenario.

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Responses Total:	8
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A 63-year-old male with ischaemic cardiomyopathy presents for a follow-up visit. He has been diabetic for the last 5 years and had an anterior myocardial infarction 4 years ago. Subsequent coronary angiography revealed three-vessel disease and he underwent coronary artery bypass grafting. One year ago he was admitted with a history of palpitations, and electrocardiogram (ECG) showed atrial fibrillation but no ST segment changes. Serial cardiac enzymes were normal and echocardiography showed an ejection fraction of 23%. He was started on amiodarone and warfarin. Other medications include carvedilol 25 mg twice daily, fosinopril 20 mg/day, furosemide 40 mg twice daily, digoxin 0.25 mg/day and pravastatin 40 mg/day. Over the last one year he has had two recurrences of atrial fibrillation. Physical examination reveals a regular pulse of 68/min and no evidence of fluid retention.

Investigations show:

Sodium	135 mmol/l
Potassium	4.5 mmol/l
Urea	8 mmol/l
Creatinine	70 mol/l
Haemoglobin	14 g/dL
White cell count	10 x 10^9/L
Digoxin Level	In therapeutic range
Thyroid function tests	normal
Electrocardiogram (ECG)	sinus rhythm with no QT prolongation
Holter monitor	no evidence of atrial fibrillation but two episode of non-sustained ventricular tachycardia (VT) each lasting 4 s and a few premature ventricular beats. The patient had no symptoms during the period of Holter monitoring

What is the next best step in management of this patient?

A	Discontinue amiodarone
B	Discontinue warfarin
C	Discontinue warfarin and amiodarone
D	Refer the patient for electrophysiological study
E	Discontinue warfarin, amiodarone and digoxin

7466

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Calculator

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Creatinine	70 mol/l
Haemoglobin	14 g/dL
White cell count	10 x 10^9/L
Digoxin Level	In therapeutic range
Thyroid function tests	normal
Electrocardiogram (ECG)	sinus rhythm with no QT prolongation
Holter monitor	no evidence of atrial fibrillation but two episode of non-sustained ventricular tachycardia (VT) each lasting 4 s and a few premature ventricular beats. The patient had no symptoms during the period of Holter monitoring

What is the next best step in management of this patient?

A Discontinue amiodarone

B Discontinue warfarin

C Discontinue warfarin and amiodarone

D Refer the patient for electrophysiological study

E Discontinue warfarin, amiodarone and digoxin

Explanation

D Refer the patient for electrophysiological study

Patients with heart failure are at increased risk of sudden cardiac death from ventricular arrhythmias. Implantable cardioverter defibrillator devices (ICD) are indicated for primary prevention of sudden cardiac death in patients who have history of prior myocardial infarction and all of the following:

- non-sustained ventricular tachycardia (VT)
- inducible arrhythmias on electrophysiological testing
- left ventricular ejection fraction of less than 35% and no worse than New York Heart Association Class III functional classification of heart failure.

ICD is also recommended in familial cardiac conditions with high risk of sudden cardiac death such as long QT syndrome, hypertrophic cardiomyopathy, Brugada syndrome, arrhythmogenic right ventricular dysplasia and following repair of tetralogy of Fallot. Therefore, this patient should be evaluated by electrophysiological studies (EPS) and if inducible arrhythmias are documented an ICD should be placed. Some trials like MADIT II have also found that ICD implantation in such patients without EPS also leads to reduction in mortality, although guidelines are yet to completely reflect this information.

A Discontinue amiodarone

Amiodarone can reduce the paroxysms of atrial fibrillation and is usually well tolerated in patients with heart failure.

B Discontinue warfarin

This patient has paroxysmal atrial fibrillation and in the setting of left ventricular dysfunction he should continue to receive anticoagulation therapy.

C Discontinue warfarin and amiodarone

This patient has paroxysmal atrial fibrillation and in the setting of left ventricular dysfunction he should continue to receive anticoagulation therapy. In addition, amiodarone can reduce the paroxysms of atrial fibrillation and is usually well tolerated in patients with heart failure.

E Discontinue warfarin, amiodarone and digoxin

This patient has paroxysmal atrial fibrillation and in the setting of left ventricular dysfunction he should continue to receive anticoagulation therapy. In addition, amiodarone can reduce the paroxysms of atrial fibrillation and is usually well tolerated in patients with heart failure. Digoxin may help in rate control.

7466

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Difficulty: Easy

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Responses Correct:	0
Responses Incorrect:	9
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A 75-year-old male presents to the emergency department with a history of sudden onset of chest pain one hour ago. The pain is sharp, severe, radiates to the back and is associated with sweating. He is known to have had hypertension for the past 8 years and is taking indapamide 1.5 mg/day. Physical examination reveals blood pressure of 145/75 mmHg, heart rate of 92/min and respiratory rate of 22/min. Heart sounds are normal and lung fields are clear to auscultation.

Investigations show:

Sodium	135 mmol/l
Potassium	4.5 mmol/l
Urea	8 mmol/l
Creatinine	70 mol/l
Haemoglobin	14 g/dL
White cell count	10 x 10^9/L
Chest X-ray	A widened mediastinum
Electrocardiogram (ECG)	sinus tachycardia and left ventricular hypertrophy by voltage criteria.
An urgent magnetic resonance angiography	Dissection of the aorta distal to the left subclavian artery

Which of the following is the most appropriate next step in management of this patient?

A	Begin intravenous labetolol
B	Begin intravenous hydralazine
C	Begin intravenous labetolol and sodium nitroprusside
D	Begin intravenous sodium nitroprusside
E	Urgent referral for surgery

7467

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Calculator

Normal Values

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A 75-year-old male presents to the emergency department with a history of sudden onset of chest pain one hour ago. The pain is sharp, severe, radiates to the back and is associated with sweating. He is known to have had hypertension for the past 8 years and is taking indapamide 1.5 mg/day. Physical examination reveals blood pressure of 145/75 mmHg, heart rate of 92/min and respiratory rate of 22/min. Heart sounds are normal and lung fields are clear to auscultation.

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An urgent magnetic resonance angiography	Dissection of the aorta distal to the left subclavian artery

Which of the following is the most appropriate next step in management of this patient?

A Begin intravenous labetolol

B Begin intravenous hydralazine

C Begin intravenous labetolol and sodium nitroprusside

D Begin intravenous sodium nitroprusside

E Urgent referral for surgery

Explanation

A Begin intravenous labetolol

Aortic dissection is classified as type A if it involves the ascending aorta regardless of the site of primary tear, and type B if it does not. This patient has type B aortic dissection. Patients with type A aortic dissection should have emergency surgery because of the high risk of mortality and complication such as aortic regurgitation, myocardial infarction and cardiac tamponade. Most patients with type B dissection should be treated medically unless they have complications such as persistent leak, rupture or compromised blood flow to renal, mesenteric or limb circulation. Beta-blockers are the mainstay of medical therapy, as they reduce the rate of left ventricular ejection and shear on the aortic wall. The aim is to reduce blood pressure to 100–120 mmHg and the pulse to near 60 bpm.

B Begin intravenous hydralazine

Hydralazine should not be used alone as it may increase rate of left ventricular ejection.

C Begin intravenous labetolol and sodium nitroprusside

Beta-blockers should be tried first to control blood pressure, only if this fails then it warrants adding sodium nitroprusside, however, it is not required to have the two agents from the onset.

D Begin intravenous sodium nitroprusside

Sodium nitroprusside can be added if blood pressure is not controlled with beta-blockers but should not be used alone as it may increase rate of left ventricular ejection.

E Urgent referral for surgery

This patient has a type B aortic dissection. Most patients with type B dissection should be treated medically unless they have complications such as persistent leak, rupture or compromised blood flow to renal, mesenteric or limb circulation. Only in the latter cases is urgent surgery warranted.

7467

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Difficulty: Difficult

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Session Progress

Responses Correct:	0
Responses Incorrect:	10
Responses Total:	10
Responses - % Correct:	0%

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A 75-year-old male presents to the emergency department with history of sudden onset of chest pain that started 2 h ago. The pain is sharp, severe, radiates to the back and is associated with sweating. He is known to have had hypertension for past 8 years and is taking indapamide 1.5 mg/day. Physical examination reveals blood pressure of 95/75 mmHg, heart rate of 108/min and respiratory rate of 27/min. The pulse is low volume with collapsing character, the neck veins are distended, apex beat is difficult to appreciate and heart sounds are distant.

Investigations show:

Sodium	135 mmol/l
Potassium	4.5 mmol/l
Urea	8 mmol/l
Creatinine	70 mol/l
Haemoglobin	14 g/dL
White cell count	10 x 10^9/L
Chest X-ray	Large cardiac silhouette and widened mediastinum
Electrocardiogram (ECG)	Sinus tachycardia and low voltage
An urgent transoesophageal echocardiography	Dissection of the ascending aorta and a moderate to large amount of blood in pericardium

What is the next best step in the management of this patient?

A	Intravenous sodium nitroprusside
B	Immediate surgery
C	Intravenous beta-blockers
D	Intravenous hydralazine
E	Pericardiocentesis

7468

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Calculator

Normal Values

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What is the next best step in the management of this patient?

A Intravenous sodium nitroprusside

B Immediate surgery

C Intravenous beta-blockers

D Intravenous hydralazine

E Pericardiocentesis

Explanation

B Immediate surgery

Aortic dissection is classified as type A if it involves the ascending aorta regardless of the site of primary tear and type B if it does not. This patient has acute type A aortic dissection complicated by haemopericardium and cardiac tamponade. Pericardiocentesis in these patients can increase the intra-aortic pressure and reopen the closed communication between false lumen and pericardium. This can lead to recurrent cardiac tamponade that may be lethal. Therefore, if these patients are relatively stable, they should have immediate surgical repair and surgical evacuation of haemopericardium.

A Intravenous sodium nitroprusside

Because this patient has type A aortic dissection with complication of haemopericardium and cardiac tamponade, treating medically would be inappropriate.

C Intravenous beta-blockers

Because this patient has type A aortic dissection with complication of haemopericardium and cardiac tamponade, treating medically would be inappropriate.

D Intravenous hydralazine

Because this patient has type A aortic dissection with complication of haemopericardium and cardiac tamponade, treating medically would be inappropriate.

E Pericardiocentesis

Only if patients with pericardial effusion from aortic dissection have marked hypotension or electromechanical dissociation, then pericardiocentesis should be performed.

7468

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Responses Correct:	0
Responses Incorrect:	11
Responses Total:	11
Responses - % Correct:	0%

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A 68-year-old male presents with history of substernal chest pain that started suddenly 2 h ago, radiated to left arm and lasted for 30 min. About 20 min ago the pain started again. He is known to have had hyperlipidaemia for the last 2 years and is taking simvastatin 40 mg/day. On physical examination, his pulse rate is 72/min; blood pressure is 115/75 mmHg and respiratory rate is 22/min. There is no jugular venous distension, heart sounds are normal and the chest is clear to auscultation. The patient is administered chewable aspirin 300 mg, sublingual nitroglycerine, morphine and unfractionated heparin infusion.

Investigations show:

Sodium	135 mmol/l
Potassium	4.5 mmol/l
Urea	8 mmol/l
Creatinine	70 mol/l
Haemoglobin	14 g/dL
White cell count	11 x 10^9/L
Electrocardiogram (ECG)	1.5 mm ST segment depression in lateral leads

If this patient has sustained a non-ST elevation myocardial infarction, which of the following cardiac markers would you expect to be raised at this time?

A	Creatine kinase
B	Lactate dehydrogenase
C	Troponin I
D	Myoglobin
E	Troponin T

7469

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Calculator

Normal Values

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A	Creatine kinase
B	Lactate dehydrogenase
C	Troponin I
D	Myoglobin
E	Troponin T

Explanation

D	Myoglobin

Myoglobin is the earliest to be elevated among all the cardiac markers listed in event of myocardial infarction (MI). Elevated levels can be detected as early as 1 h of MI (range 1–4), peaks in 6–7 h and returns to normal in 24 h. Myoglobin however is much less specific than the troponins and can be elevated in skeletal muscle injury and renal impairment.

A	Creatine kinase

Creatine kinase begins to rise 3–12 h after MI and peak concentrations are reached in 18–24 h.

B	Lactate dehydrogenase

Lactate dehydrogenase begins to rise in 6–12 h.

C	Troponin I

Troponins begin to rise 3–12 h after MI. Troponin I is the most specific of all cardiac markers listed. Troponins remain elevated up to 10 days after the MI, and therefore can be helpful in

E	Troponin T

Troponins begin to rise 3–12 h after MI. Troponins remain elevated up to 10 days after the MI, and therefore can be helpful in establishing the diagnosis in patients who present after several days.

7469

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Responses Correct:	0
Responses Incorrect:	12
Responses Total:	12
Responses - % Correct:	0%

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A 38-year-old female presents with history of progressive shortness of breath of 3 months' duration. She gets short of breath on ordinary physical activity at home. She has also noticed swelling of the feet and abdomen. On physical examination her pulse rate is 96/min, and she has a regular blood pressure 110/70 mmHg and respiratory rate of 20/min. She has jugular venous distension, bibasilar inspiratory crepitations, diminished first heart sound and widely split second heart sound with loud pulmonary component. A rumbling diastolic murmur is heard at the apex.

Investigations show:

Sodium	135 mmol/l
Potassium	4.5 mmol/l
Urea	8 mmol/l
Creatinine	70 mol/l
Haemoglobin	14 g/dL
White cell count	10x 10^9/L
Electrocardiogram (ECG)	Left atrial hypertrophy, right ventricular hypertrophy and right axis deviation
Chest X-ray	Straightening of the left heart border and prominent pulmonary arteries and Kerley B lines
Echocardiogram	Heavily calcified mitral leaflets, mitral area 0.9 cm^2 and pulmonary hypertension

What is the most appropriate management of this patient?

A	Observe and follow up in clinic in 2 weeks
B	Mitral valve replacement
C	Blood cultures and intravenous antibiotics
D	Medical therapy
E	Percutaneous mitral valvotomy

7470

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Calculator

Normal Values

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C	Blood cultures and intravenous antibiotics
D	Medical therapy
E	Percutaneous mitral valvotomy

Explanation

B Mitral valve replacement

This patient has severe symptomatic mitral stenosis and therefore should have either valvotomy or mitral valve replacement. Most of these patients can be managed with percutaneous mitral balloon valvotomy unless they have contraindications. Contraindications to percutaneous balloon valvotomy include:

- moderate to severe mitral regurgitation
- left atrial thrombus
- heavily calcified mitral valve
- concomitant coronary artery or other valve disease requiring surgery.

These patients should undergo mitral valve replacement.

A Observe and follow up in clinic in 2 weeks

This patient has severe symptomatic mitral stenosis and therefore to merely observe the patient will not suffice as symptoms will worsen.

C Blood cultures and intravenous antibiotics

There is no suspicion of bacterial endocarditis therefore blood cultures and intravenous antibiotics is inappropriate. For bacterial endocarditis in addition to a new onset murmur there may be fever, Janeway lesions and Roth's spots.

D Medical therapy

This patient has severe symptomatic mitral stenosis therefore surgery is in preference to medical therapy. Medical management is reserved for patients who are asymptomatic or mitral stenosis is not severe.

E Percutaneous mitral valvotomy

This patient has a contraindication to valvotomy because she has a heavily calcified mitral valve.

7470

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Responses Correct:	0
Responses Incorrect:	13
Responses Total:	13
Responses - % Correct:	0%

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A 65-year-old hypertensive male presents to the emergency department with a history of left praecordial pain of three hours' duration associated with profuse sweating. Electrocardiogram (ECG) reveals anterior myocardial infarction. He is given chewable aspirin, recombinant tissue plasminogen activator, intravenous (iv) heparin infusion and iv esmolol. He improves over the next few hours. ST segment elevation decreases by more than 50% and no arrhythmias are documented. Next day he again complains of chest pain which increases on reclining and radiating to the edge of the left trapezius. A pericardial friction rub is heard.

Some investigations were done and revealed:

Sodium	135 mmol/l
Potassium	4.5 mmol/l
Urea	8 mmol/l
Creatinine	70 mol/l
Haemoglobin	14 g/dL
White cell count	10x 10^9/L
Electrocardiogram (ECG)	no significant new changes
Echocardiogram	Anterior hypokinesia, ejection fraction of 35% and no evidence of pericardial effusion

What is the next best step in management of this patient?

A	Discontinue iv heparin and increase aspirin to 650 mg every 4 h
B	Discontinue iv heparin and start ibuprofen
C	Discontinue iv heparin and start prednisolone
D	Start regular paracetamol
E	Increase aspirin to 650 mg every 4 h

7471

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Calculator

Normal Values

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D	Start regular paracetamol
E	Increase aspirin to 650 mg every 4 h

Explanation

D Start regular paracetamol

Early infarct-associated pericarditis usually occurs with large transmural infarctions and is characterised by pleuritic chest pain. Radiation to the trapezius ridge is a feature that is rarely seen with ischaemic pain and is a useful clue to diagnosis. Characteristic electrocardiogram (ECG) changes may not be seen because of changes of myocardial infarction (MI). Patients can usually be managed with aspirin and analgesics such as paracetamol.

A Discontinue iv heparin and increase aspirin to 650 mg every 4 h

Anticoagulation can be continued if there is no pericardial effusion, as in such cases the risk of haemorrhagic pericarditis is low. However in the presence of significant effusion or if the effusion is increasing, heparin should be discontinued.

B Discontinue iv heparin and start ibuprofen

Anticoagulation can be continued if there is no pericardial effusion, as in such cases the risk of haemorrhagic pericarditis is low. However in the presence of significant effusion or if the effusion is increasing, heparin should be discontinued.

C Discontinue iv heparin and start prednisolone

Anticoagulation can be continued if there is no pericardial effusion, as in such cases the risk of haemorrhagic pericarditis is low. However in the presence of significant effusion or if the effusion is increasing, heparin should be discontinued. There is no evidence that prednisolone has added benefit in pericarditis.

E Increase aspirin to 650 mg every 4 h

The dosage of aspirin 650mg every 4 hours is too high. It is important to give other analgesia such as paracetamol to control the pain.

7471

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Responses Correct:	0
Responses Incorrect:	14
Responses Total:	14
Responses - % Correct:	0%

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A 32-year-old electrician presents with history of cramping pain in his right calf of three months' duration. Pain usually starts after walking a couple of blocks and forces him to stop. After stopping for few minutes, the pain is relieved. He is a lifelong non-smoker and has no family history of cardiovascular disease. He consumes three to four units of alcohol every week. Physical examination reveals an obese young male with absent right pedal pulse. He also has palmar and tuberous xanthomas. His ankle brachial index is 0.6 on the right and 0.9 on the left.

The results of laboratory investigations are:

Electrocardiogram (ECG)	Normal
Chest X-ray	Normal
White cell count	8×10^9/l
Haemoglobin	11.9 g/dl with normal mean corpuscular volume and mean corpuscular haemoglobin
Platelets	188×10^9/l
Serum cholesterol	8.2 mmol/l
Triglycerides	4.1 mmol/l
High-density lipoprotein (HDL)	1 mmol/l
Thyroid-stimulating hormone	28 mU/l
Total thyroxine	50 nmol/l (58–155nmol/l)

What is the most likely cause of his lipid abnormality?

A	Familial combined hyperlipidaemia
B	Hyperchylomicronaemia
C	Hypothyroidism
D	Dysbetalipoproteinaemia
E	Obesity

7472

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Calculator

Normal Values

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C Hypothyroidism

D Dysbetalipoproteinaemia

E Obesity

Explanation

D Dysbetalipoproteinaemia

Palmar xanthomas are pathognomonic of dysbetalipoproteinaemia (type III hyperlipoproteinaemia). It is caused by mutation in apoprotein E, and transmitted as an autosomal recessive trait and usually requires a secondary exacerbating metabolic factor for expression of the phenotype. Therefore, secondary causes of hyperlipidaemia such as hypothyroidism, obesity, diabetes mellitus, renal insufficiency, high-calorie, high-fat diet or alcohol are often encountered at diagnosis, as in this patient who has hypothyroidism and obesity. Patients are predisposed to peripheral vascular disease and coronary artery disease. Lipid profile in these patients reveals elevated cholesterol and triglycerides while high-density lipoprotein (HDL) is normal and low-density lipoprotein(LDL) low. Definitive diagnosis can be made by lipoprotein electrophoresis or genotyping of apoprotein E. Treatment involves management of secondary causes, which in this case are hypothyroidism and obesity. Drug therapy can be employed if treatment of secondary causes yields unsatisfactory results.

A Familial combined hyperlipidaemia

There is no palmar xanthomas in Familial combined hyperlipidaemia. This type of lipid disorder runs in families and is typified by high cholesterol levels, increased LDL and triglyceride concentrations, often accompanied by a decreased HDL. On lipoprotein electrophoresis there is hyperlipoproteinemia type IIB. It affects around one in 200 persons. Individuals who have coronary artery disease before age 60years have this disorder.

B Hyperchylomicronaemia

There is no palmar xanthomas in hyperchylomicronaemia. There is lipoprotein lipase deficiency, apolipoprotein(apo) CII deficiency or LPL inhibition. This syndrome is characterized by hyperchylomicronaemia, attacks of epigastric pain, recurrent pancreatitis and the presence of eruptive xanthomas, may ultimately lead to necrotizing pancreatitis or pancreatic insufficiency. The treatment involves lifelong adherence to a low-fat diet to prevent hyperchylomicronaemia and its sequelae.

C Hypothyroidism

There is no palmar xanthomas in hypothyroidism. Hypothyroid patients have increased levels of total cholesterol and LDL. Hypothyroidism is a common cause of secondary dyslipidaemia.

E Obesity

There is no palmar xanthomas in obesity. Body mass index is positively correlated with triglyceride levels and negatively correlated with HDL cholesterol.

7472

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Responses Correct:	0
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Responses Total:	15
Responses - % Correct:	0%

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A 19-year-old college student presents with history of three episodes of transient loss of consciousness over the past 2 months. All three episodes happened while the patient was standing and were preceded by a feeling of nausea, warmth and light-headedness. He regains consciousness shortly after the collapse but he continues to feel nauseated and fatigued for about 15 min. There is no past medical history of note. His father had died of myocardial infarction at age of 60 years. His physical examination is unremarkable and there is no orthostatic hypotension.

Investigations reveal:

Sodium	135 mmol/l
Potassium	4.5 mmol/l
Urea	8 mmol/l
Creatinine	70 mol/l
Haemoglobin	14 g/dL
White cell count	10x 10^9/L
Electrocardiogram (ECG)	normal
Chest X-ray	normal
Echocardiogram	normal

What is the best investigation in evaluation of this patient?

A	24-hour electrocardiogram (ECG) monitoring
B	Computed tomography (CT) of the head
C	Electroencephalogram (EEG)
D	Exercise electrocardiography
E	Tilt table test

7473

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Calculator

Normal Values

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B Computed tomography (CT) of the head

C Electroencephalogram (EEG)

D Exercise electrocardiography

E Tilt table test

Explanation

E Tilt table test

The history in this case suggests vasovagal syncope. The patients with vasovagal syncope are usually young and healthy, episodes occur while standing and there is a prodrome of nausea, warmth, pallor or sweating. The syncope lasts briefly, but nausea, warmth and sweating may persist for some time. Patients may also report fatigue on recovery. If structural heart disease is excluded and syncope is reproduced on tilt table testing along with fall in blood pressure and heart rate, then this is diagnostic of vasovagal syncope.

A 24-hour electrocardiogram (ECG) monitoring

Syncope associated with arrhythmias is usually sudden, without prodromal symptoms and has rapid recovery. This patient has normal electrocardiogram (ECG) and echocardiography therefore 24-hour electrocardiogram is unlikely to contribute anything. It is unlikely to be an arrhythmia.

B Computed tomography (CT) of the head

Symptoms are not suggestive of seizures or structural brain disease. We may expect added symptoms of post-ictal confusion or incontinence during loss of consciousness episodes if there was indication of seizures.

C Electroencephalogram (EEG)

Symptoms are not suggestive of seizures or structural brain disease. We may expect added symptoms of post-ictal confusion or incontinence during loss of consciousness episodes if there was indication of seizures.

D Exercise electrocardiography

Syncope associated with arrhythmias is usually sudden, without prodromal symptoms and has rapid recovery. This patient has normal electrocardiogram (ECG) and echocardiography therefore an exercise electrocardiography is unlikely to add anything. It is unlikely to be due to angina or coronary ischaemia inducing arrhythmia.

7473

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You asked to evaluate a pregnant female in the obstetrics department who has been complaining of severe shortness of breath for the last 5 h. She was admitted one day earlier, in her 30th week of gestation for premature labour. She was started on intravenous terbutaline and had been doing well. About 6 h ago she started complaining of shortness of breath that has been progressively worsening. She denies any chest pain, palpitations or lower limb pain and swelling. She has no past medical history of note and her prenatal examination had been normal.

Physical examination reveals a dyspnoeic lady with respiratory rate of 25/minute, blood pressure 115/90 mmHg, and pulse 122/minute. She has jugular venous distension and bilateral diffuse inspiratory crackles.

Investigations reveal:

White cell count	11×10^9/l
Hemoglobin	12 g/dl
Platelet	660×10^9/l
Electrocardiogram (ECG)	Sinus tachycardia
Chest X-ray	Bilateral alveolar type infiltrates and normal cardiothoracic ratio

Which of the following is most likely diagnosis?

A	Mitral stenosis
B	Myocarditis
C	Peripartum cardiomyopathy
D	Pulmonary embolism
E	Tocolysis-associated pulmonary oedema

7474

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Calculator

Normal Values

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C Peripartum cardiomyopathy

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E Tocolysis-associated pulmonary oedema

Explanation

E Tocolysis-associated pulmonary oedema

Tocolytics are medications administered for the suppression of premature contractions. Acute pulmonary oedema can occur with administration of β_2 agonists for tocolysis in up to 5–15% of cases. It usually occurs after 24 h of administration of these agents. The chest X-ray reveals pulmonary infiltrates and normal heart size. Concomitant use of corticosteroids that are often administered for lung maturation have also been implicated as risk factor for development of tocolysis-associated pulmonary oedema. Treatment involves stopping the tocolytics, oxygen and careful volume control.

A Mitral stenosis

As the patient's examination was normal prior to this event, mitral stenosis is less likely. A mitral stenosis murmur will present with an loud first heart sound which may be palpable because of the increased force in closing the mitral valve. An opening snap that is a high pitched sound heard after second heart sound may be heard. There is a mid-diastolic rumbling murmur with presystolic accentuation heard after the opening snap.

B Myocarditis

Myocarditis cause systolic dysfunction and will be expected to show cardiomegaly on chest X-ray. Other symptoms of myocarditis will include fever, sweats, chills and shortness of breath. In viral myocarditis there is typically a 1-2 week history of preceeding flulike symptoms of fevers, arthralgia and malaise with pharyngitis, tonsillitis or upper respiratory tract symptoms.

C Peripartum cardiomyopathy

Peripartum cardiomyopathy cause systolic dysfunction and will be expected to show cardiomegaly on chest X-ray. Peripartum cardiomyopathy typically presents in the last month of pregnancy and up-to 6 months postpartum.

D Pulmonary embolism

Pulmonary embolism is unlikely to cause bilateral chest infiltrates. Symptoms of pulmonary embolism include haemoptysis, pleuritic chest pain, tachycardia and tachypnoea.

7474

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Responses Total:	17
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A 67-year-old lady was admitted to the Emergency Department with central chest pains that had started 3 h earlier. The pain was crushing in nature, radiating to both arms and associated with nausea and vomiting. She has a past medical history of angina, hypertension and type II diabetes. She is on the following medications: glyceryl trinitrate (GTN) spray prn, amlodipine 10 mg od, atorvastatin 40 mg nocte, metformin 500 mg tds and aspirin 75 mg od.

On examination, she was sweaty with a blood pressure of 155/95 mmHg, pulse of 98/min and regular. Her respiratory rate was 24/min and her chest was clinically clear. Her jugular venous pulse was just visible, first and second heart sounds were heard with no added murmurs. The electrocardiogram (ECG) showed ST elevation of 3 mm in V_1–V_4, with reciprocal ST depression in the inferior leads.

Investigations:

Hb	13.8 g/dl
WCC	14.1×10^9/l
PLT	240×10^9 /l
Na^+	14.1×10^9 /l
K^+	3.8 mmol/l
Creatinine	121 mol/l
MCV	88.6 fll
Urea	7.1 mmol/l

A bolus infusion of tenecteplase was given, together with diamorphine and metoclopramide. Over the next 30 min, she suddenly started becoming progressively hypotensive with a blood pressure of 72/53 mmHg, pulse of 124/min sinus rhythm. Auscultation of her chest revealed a pan-systolic murmur loudest at the lower left sternal edge associated with an audible third heart sound.

What is the most likely diagnosis?

A	Acute mitral regurgitation
B	Ruptured ventricular free wall
C	Ruptured ventricular septum
D	Pulmonary embolism
E	Pericardial tamponade

7485

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Calculator

Normal Values

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A Acute mitral regurgitation

B Ruptured ventricular free wall

C Ruptured ventricular septum

D Pulmonary embolism

E Pericardial tamponade

Explanation

C Ruptured ventricular septum

The most likely diagnosis is ruptured ventricular septum. This rare complication (according to autopsy studies, occurring in 1-3% of cases of MI as opposed to around 10% incidence for ventricular free wall rupture) occurs most commonly after anterior myocardial infarction. The clinical presentation ranges from asymptomatic murmur to cardiogenic shock. Post-infarction ventricular septal defects complicate approximately 1-3% of cases of acute MI, and account for about 5% of early deaths after MI. The average time from infarction to rupture has been reported to be between 2 and 4 days, but it may be as short as a few hours or as long as 2 weeks. An echocardiogram would confirm the diagnosis, and Swan-Ganz catheterisation would help determine the degree of biventricular failure. Mortality is very high, in the order of 80%, and the outlook in this patient is poor given her age, female sex and medical history of diabetes and hypertension. Although right-sided failure is more common in patients with post-infarction ventricular septal rupture, left-sided failure and refractory pulmonary oedema are more prominent in patients with ruptured papillary muscle. Papillary muscle rupture is rarer, with a reported incidence of <1%.

A Acute mitral regurgitation

Whilst mitral regurgitation would also result in a pan-systolic murmur and hypotension, the time to onset is arguably far too short here. Median onset of MR post-myocardial is 7-10 days, although it can be seen earlier with acute papillary muscle rupture.

B Ruptured ventricular free wall

Rupture of the ventricular free wall will result in sudden death of the patient, and this may be the first manifestation of coronary artery disease in a small percentage of patients with acute myocardial infarction.

D Pulmonary embolism

In pulmonary embolism the signs would include tachycardia, haemoptysis and shortness of breath, and there may be signs of the cause of the pulmonary embolism such as a swollen calf, suggesting a deep vein thrombosis.

E Pericardial tamponade

With cardiac tamponade, the clinical features will include a low arterial blood pressure, distended neck veins and distant heart sounds. There is also a narrow pulse pressure.

7485

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Investigations:

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MCV	88.6 fl
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WCC	14.1×10^9 /l
Na^+	141 mmol/l
K^+	3.8 mmol/l
Urea	7.1 mmol/l
Creatinine	121 mol/l

A bolus infusion of tenecteplase was given, together with diamorphine and metoclopramide. She is transferred to the coronary care unit.

You are asked to see her on day 4 post-infarct because the nurses are very concerned as she has become progressively more short of breath with hypotension, BP of 72/53 mmHg and pulse of 124/min sinus rhythm. Auscultation of her chest revealed a pan-systolic murmur, loudest at the lower left sternal edge and associated with an audible third heart sound.

An urgent echocardiogram at the time showed hyper-dynamic left ventricular function, muscular ventricular septal defect, dilated right ventricle and moderate tricuspid regurgitation.

You arrange review with respect to intra-aortic balloon pump insertion.

What is the most important additional intervention for this lady?

A	Afterload reduction
B	Immediate surgery
C	Dobutamine
D	Diuretics
E	Dopamine

7486

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Calculator

Normal Values

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A Afterload reduction

B Immediate surgery

C Dobutamine

D Diuretics

E Dopamine

Explanation

B Immediate surgery

Immediate surgery is recommended whatever the clinical status of the patient. The most important determinant of early outcome following post-infarction ventricular septal rupture is the development of heart failure. The associated cardiogenic shock leads to end-organ malperfusion, which may be irreversible. Clearly, performing surgery so close to both the infarct and thrombolysis carries a very high operative mortality, but you are left with little choice in this situation.

A Afterload reduction

Medical management is usually futile in post-infarction ventricular septal rupture, but afterload reduction may be tried. Afterload reduction increases effective left ventricular stroke volume by reducing left-to-right shunting. Intravenous afterload-reducing pharmacotherapy, such as sodium nitroprusside, has the advantage of being rapidly titrated or emergently discontinued compared with oral agents.

C Dobutamine

Dobutamine helps improve cardiac contractility in cardiogenic shock. However, dopamine would be a preferred agent in hypotension. In post-infarction ventricular septal rupture, immediate surgery is the only intervention that may potentially improve outcome.

D Diuretics

Diuretics may reduce pre-load on the heart, which may help in cardiac failure from other causes, but in this situation it would be ineffective because immediate surgery is the only intervention that may potentially improve outcome.

E Dopamine

Dopamine, an endogenous catecholamine, has been suggested to improve renal function in patients with congestive heart failure. However, there is insufficient evidence supporting its use and it is now not regularly used for this purpose. Certainly, it would not have a role in improving outcome in post-infarction ventricular septal rupture.

7486

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A 70-year-old man was admitted to the Emergency Department with central chest pains, which had started three hours earlier. The pain was crushing in nature, radiating to both arms and associated with nausea and vomiting. He has a past medical history of angina, hypertension and type II diabetes. He is on the following medications: glyceryl trinitrate (GTN) spray prn, amlodipine 10 mg od, atorvastatin 40 mg nocte, metformin 500 mg tds and aspirin 75 mg od. On examination, he was sweaty with a blood pressure of 155/95 mmHg, pulse of 98/min and regular. His respiratory rate was 24/min and his chest was clinically clear. His jugular venous pulse was just visible; first and second heart sounds were heard with no added murmurs.

Investigations:

Hb	15.8 g/dl
WCC	14.1×10^9/l
PLT	240×10^9 /l
Na^+	14.1×10^9 /l
K^+	3.8 mmol/l
Creatinine	121 mol/l
MCV	88.6 fl
Urea	7.1 mmol/l
ECG	ST elevation of 3 mm in V_1–V_4, with reciprocal ST depression in the inferior leads

He was given diamorphine and metoclopramide before being taken to the cardiac catheterisation laboratory, where he received urgent coronary angioplasty. Subsequently, he was transferred to the CCU for further care. Two days into his recovery he suddenly developed recurrent chest pain. His blood pressure become unrecordable and he went into profound shock with electromechanical dissociation. Resuscitative measures were started but the patient died within a few minutes.

What is the most likely complication?

A	Ventricular free wall rupture
B	Acute mitral regurgitation
C	Extension of the infarct
D	Pulmonary embolism
E	Ruptured ventricular septum

7487

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Calculator

Normal Values

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A 53-year-old man was referred to the cardiology clinic by his general practitioner (GP) for an abnormal pulse. The man had gone to see his GP for a regular check-up when he was found to have an abnormal heart rhythm. His past medical history was unremarkable and he was not on any medication. He does not smoke and takes about 7 units of alcohol a week.
On examination, he was comfortable with a blood pressure of 125/65 mmHg, pulse of 68/min and irregularly irregular. His jugular venous pressure was not raised and his chest was clinically clear. He had a variable S1 but no murmurs. Full blood count, urea and electrolytes, thyroid function tests, liver function tests, lipids and echocardiogram were all essentially within normal limits. Electrocardiogram (ECG) showed atrial fibrillation

Which one of the following medications would you start this patient on?

A	Low molecular weight heparin transitioning to Warfarin prior to elective cardioversion
B	Diltiazem
C	Digoxin
D	Bisoprolol
E	Sotalol

7489

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Calculator

Normal Values

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B	Diltiazem
C	Digoxin
D	Bisoprolol
E	Sotalol

Explanation

Previously this younger patient with probable lone AF would be given aspirin alone and then followed up periodically in the cardiology clinic. Now however NICE guidelines suggest that rhythm control should be attempted. In that sense the first step is warfarinisation, followed by a routine cardioversion. Rate control is inappropriate in a young patient presenting for the first time, and oral anti-arrhythmics are less likely to be effective and run the risk of precipitating an embolus if they succeed in re-attaining sinus rhythm (SR) without anti-coagulation.

7489

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A 69-year-old man is admitted to the Emergency Department with sudden onset of palpitations. The palpitations started 3 h ago and are associated with shortness of breath, light-headedness and chest discomfort. He has had two similar episodes of palpitations in the last 2 months that have lasted only a few seconds. He had never sought any medical advice on these previous palpitations. His past medical history is unremarkable and he is not on any medication. On examination, he is dyspnoeic with a blood pressure of 102/55 mmHg, pulse rate of >>120/min and a respiratory rate of 28/min. His oxygen saturation on air is 90%, and his chest is clinically clear. His jugular venous pressure is not raised. First and second heart sounds are heard but you cannot appreciate whether there is any murmur. Initial attempts at carotid sinus massage have failed and he is becoming increasingly distressed.

Investigations:

ECG	Heart rate of 188/min with a narrow QRS complex
XR	Normal

How would you best determine the underlying cardiac rhythm?

A	Ask patient to do a Valsalva manoeuvre
B	Give rapid intravenous adenosine
C	Give 100% oxygen
D	Give intravenous β-blocker
E	Give intravenous calcium channel blocker

7490

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Calculator

Normal Values

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Explanation

B	Give rapid intravenous adenosine

To determine the underlying rhythm, adenosine 6 mg in a large peripheral vein should slow the heart rate sufficiently to unveil the underlying rhythm. If the patient does not respond to 6 mg adenosine, the dose could be increased to 12 mg. Adenosine will have the following effects on the narrow complex: atrial fibrillation or atrial flutter (transient atrioventricular block), atrioventricular nodal re-entrant tachycardial or atrioventricular re-entrant tachycardia (may terminate), atrial tachycardia – transient AV block.

A	Ask patient to do a Valsalva manoeuvre

As the patient is dyspnoeic and hypoxic, it would not be appropriate to carry out a Valsalva manoeuvre because of the practical difficulty due to poor patient compliance.

C	Give 100% oxygen

Although oxygen should be administered to correct hypoxia, it will not correct the underlying rhythm.

D	Give intravenous β-blocker

It is important to establish the underlying rhythm with adenosine. Giving a β-blocker will not help in diagnosing the exact rhythm.

E	Give intravenous calcium channel blocker

It is important to establish the underlying rhythm with adenosine. Giving a calcium channel blocker will not help in diagnosing the exact rhythm.

7490

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A 72-year-old man is referred to the cardiology clinic because of two syncopal episodes over the past month. Both episodes have happened while he had been doing some chores around the house. His past medical history is unremarkable and he is not on any medication. On each occasion he has noticed a feeling of sounds becoming muffled, a sensation that his heart is pounding, some nausea and then his vision going black before collapsing to the ground. His wife has witnessed one episode and said that he was very pale and rather clammy, he recovered consciousness within a few seconds of falling and within less than a minute was back to his normal self. His physical examination is essentially normal and there is no postural drop in his blood pressure.

Investigations:

Hb	12.8 g/dl
PLT	240 × 10^9 /l
WCC	12.1 × 10^9 /l
Na+	141 mmol/l
K+	3.8 mmol/l
Urea	7.1 mmol/l
Creatinine	78 mol/l
Lipids	Normal
Liver function tests	Normal
Thyroid function tests	Normal
Echocardiogram	Normal

What would you advise this gentleman?

A	Sit down whenever he feels dizzy
B	He needs an angiogram
C	He needs a computed tomography (CT) scan of his chest
D	He needs a CT scan of his head
E	He needs Dopplers of his carotids

7491

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Calculator

Normal Values

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Investigations:

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Urea	7.1 mmol/l
Creatinine	78 mol/l
Lipids	Normal
Liver function tests	Normal
Thyroid function tests	Normal
Echocardiogram	Normal

What would you advise this gentleman?

A Sit down whenever he feels dizzy

B He needs an angiogram

C He needs a computed tomography (CT) scan of his chest

D He needs a CT scan of his head

E He needs Dopplers of his carotids

Explanation

A Sit down whenever he feels dizzy

In dealing with blackouts, it is vital to establish what the patient means by 'blackout'. You need to take a detailed history from both the patient and the witness. The differential diagnosis is wide and includes vasovagal syncope, situational syncope, epilepsy and Stokes–Adams attacks, to mention only a few. The detailed history should be able to narrow down the likely diagnosis, which in the above patient is vasovagal syncope. Onset is over a few seconds and is often preceded by sweating, pallor and visual field defects. The patient falls to the ground and is unconscious for about 2 min. Incontinence of urine is rare, there is no tonic-clonic sequence and there is no prolonged confusion or amnesia. It is rare for anyone to faint through vasovagal mechanisms while seated or lying flat (such an occurrence being suggestive rather of a possible cardiac cause). If symptoms persist, then a tilt-table test may be sensible.

B He needs an angiogram

There is no indication this may be related to coronary ischaemia. We would expect an abnormal electrocardiogram or chest pain if angina was suspected. The most common symptom of myocardial infarction is central chest pain that radiates to the left shoulder, arm, back, neck or jaw. It lasts for more than a few minutes and is associated with autonomic symptoms such as heartburn, shortness of breath, nausea, pre-syncope or lethargy. About 30% of patients have atypical symptoms – these may include little or no history of symptoms.

C He needs a computed tomography (CT) scan of his chest

There is no indication that any intra-thoracic lesion may be responsible, and so any dissection would cause severe chest pain. Intra-thoracic lesions that may lead to syncope include dissecting aorta. However, dissecting thoracic aorta will present with central chest pain that would radiate to the back, often described as a 'tearing' pain. There are other symptoms such as vomiting, sweating and nausea. Other symptoms may manifest from decreased blood supply, such as stroke or mesenteric ischaemia.

D He needs a CT scan of his head

It is unlikely to be an intracranial lesion as there is no seizure or fitting. Neurological disorders associated with seizures may manifest with a variety of presentations, from brief unconsciousness to prolonged periods of uncontrollable shaking. There may be associated incontinence of urine or faeces. Some seizures may occur without any warning, whilst in others focal seizures are often preceded by certain experiences known as auras, where there may be visual, hearing or abnormal olfactory sensations.

E He needs Dopplers of his carotids

There is no indication of carotid abnormality, such as dizziness on head turning or carotid bruit heard on examination. Carotid insufficiencies may cause transient ischaemic attacks. These may present with sudden, severe headache of unknown cause, dizziness or loss of balance and there may be weakness in the limbs or temporary loss of vision.

7491

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A 72-year-old retired policeman comes to the cardiology clinic for follow-up for his heart failure. He had been hospitalised for the fourth time in 4 months for congestion. His left ventricular ejection fraction is 22% (normal is 55%–75%). Shortness of breath interrupts sleeping and any physical activity he tries to engage in. He has chronic coronary artery disease and had quadruple bypass 3 years ago. He is on maximal medication for his heart failure and is being followed up in an advanced heart failure programme. He expresses a willingness to try anything to feel better. His BP is stable at 110/70 mmHg, pulse is 75/min and regular, and there is no QRS widening on his ECG.

Which one of the following would be the most appropriate intervention you could offer this gentleman, (although not currently supported in UK due to lack of RCT evidence)?

A	Heart transplantation
B	Left ventricular assist device (LVAD)
C	Palliative care
D	Artificial heart
E	Home oxygen

7492

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A	Heart transplantation
B	Left ventricular assist device (LVAD)
C	Palliative care
D	Artificial heart
E	Home oxygen

Explanation

This patient has recurrent heart failure despite having received the standard therapies known to improve outcome. In the setting of limited donor availability, cardiac transplantation would not be routinely offered to patients in this age group. Exceptions, where transplant is considered at ages above 55-60, are very rare and dependent upon "physiological age" including lack of co-morbidities outside cardiovascular disease. Data suggest that highly selected patients with refractory heart failure may be candidates for implantation of a LVAD as a permanent or destination therapy. These are patients who are not expected to recover from heart failure and who are unsuitable for transplant due to age or co-morbidities. Survival with LVADs is currently about 50% at 1 year. Patients have returned to employment and various other activities after receiving LVADs.

7492

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Investigations:

Na^+	125 mmol/l
K^+	5.5 mmol/l
eGFR	30 ml/min
CXR	Bilateral interstitial shadowing, cardiomegaly
Echocardiogram	Left ventricular ejection fraction 22% (normal 55–75%)

He expresses a willingness to try anything to feel better. Which of the following options would be the most likely beneficial treatment?

A	Increase spironolactone
B	Increase digoxin
C	No treatment would be useful because he is already on maximal medication
D	Left ventricular assist device
E	Stop rampril

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Explanation

D	Left ventricular assist device

The Randomised Evaluation of Mechanical Assistance Therapy as an alternative in Congestive Heart failure (REMATCH) trial demonstrated 52% overall survival at 1 year in 68 non-transplantation candidates randomised to a left ventricular assist device. Subsequent 1-year survival in registries also centres around 50%. Outcomes are improving with device modifications and with strong emphasis on preventing infection. Therefore, of the options available, a left ventricular assist device is the most appropriate option.

A	Increase spironolactone

A landmark study, 'RALES Trial', reported that the use of spironolactone in addition to standard medical therapy for patients with heart failure resulted in a reduction in mortality and hospitalization rate. Aldosterone antagonism with spironolactone is therefore considered for all patients with left ventricular ejection fraction of less than 35% and NYHA Class III-IV. However, a subsequent study showed that since this increased prescription of spironolactone there has been a rise in morbidity associated with hyperkalaemia. In this patient with renal impairment, because the potassium is already slightly elevated at 5.5 mmol/l, further increase in spironolactone may not confer additional benefit with larger increase in potassium, and therefore this is not the correct answer.

B	Increase digoxin

Evidence from clinical trials supports the use of digoxin in heart failure with left ventricular systolic dysfunction, especially in patients with advanced symptoms. However, there is no evidence that digoxin improves survival. Digoxin is excreted by the kidneys; because there is renal impairment in this patient, increasing digoxin further may make the risk of digoxin toxicity higher. This is not the correct answer, therefore.

C	No treatment would be useful because he is already on maximal medication

This patient is on maximal medical therapy for his heart failure, but a left ventricular assist device would still be appropriate.

E	Stop rampril

It is well established that ACE-I improves long-term outcomes in patients with reduced left ventricular ejection fraction. Furthermore, in a landmark trial, the 'HOPE Trial', ramipril was reported to significantly reduce cardiovascular events in high-risk patients with *normal* ejection fractions. In the current scenario, stopping the ACE-I would not be appropriate because there are both cardiac and renal benefits with administration of an ACE-I.

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You receive a phone call from a 67-year-old lady you had seen in the cardiology clinic the previous week. She had been started on warfarin 2 months previously for her chronic atrial fibrillation. She tells you that she forgot to take her warfarin the previous day and wants to find out if she should take a double dose today.

What would you advise her to do?

A	Take the usual dose
B	Take a double dose
C	Take one and a half times the usual dose
D	Go to the anticoagulation clinic
E	Take the usual dose and an aspirin

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E	Take the usual dose and an aspirin

Explanation

Warfarin should be taken about the same time each day. If she forgot to take her warfarin, she could take it later that day. If she forgot to take it one day, she should not take a double dose the next day. She should make a note and let the clinic know when she attends.

7494

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A 66-year-old man, admitted with infective endocarditis caused by *Streptococcus faecalis*, was treated with intravenous antibiotics for 6 weeks. He had a prosthetic metallic aortic valve put in 3 years ago for significant aortic stenosis.

Investigations:

Repeated blood cultures	-
Inflammatory markers (after 5 weeks' antibiotics)	Upper end of the normal range
Most recent trans-oesophageal echocardiogram (after 6 weeks' antibiotics)	Some tiny vegetations on the prosthetic aortic valve

How should this patient be managed?

A	Change to oral antibiotics for another two weeks
B	Discharge the patient
C	Continue intravenous antibiotics for another week
D	Do a trans-thoracic echocardiogram
E	Replace the metallic aortic valve

7495

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Explanation

B Discharge the patient

The patient could be discharged and followed up as an outpatient. Stratification of patients into groups that are at high and low risk for heart failure, systemic embolisation, need for surgical intervention and death, based on the presence or absence of vegetations, remains controversial. In this patient, whose inflammatory markers have returned to normal, he could be followed as an outpatient because this indicates that it is unlikely there has been a further resurgence of infection. If there was a para-prosthetic leak or obstruction of the valve, the patient would probably need surgical intervention.

A Change to oral antibiotics for another two weeks

Inflammatory markers have returned to normal, and there is no evidence that continuing antibiotics is beneficial. The patient has completed the course.

C Continue intravenous antibiotics for another week

Inflammatory markers have returned to normal, and there is no evidence that continuing antibiotics is beneficial. The patient has completed the course.

D Do a trans-thoracic echocardiogram

Trans-oesophageal echo is more sensitive in picking up micro-vegetations than trans-thoracic echo.

E Replace the metallic aortic valve

In this patient, whose inflammatory markers have returned to normal, he could be followed as an outpatient because this indicates that it is unlikely there has been a further resurgence of infection. If there was a para-prosthetic leak or obstruction of the valve, the patient would probably need surgical intervention.

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A 50-year-old man comes to the cardiology clinic for follow-up. He has been annually followed up in the clinic for 10 years for his aortic stenosis. He informs you that his exercise tolerance has decreased. He gets some chest discomfort and dizziness on strenuous exertion.
On examination, he is comfortable with a blood pressure of 125/85 mmHg, pulse of 76/min and regular. His jugular venous pulse is not raised, there are bibasal crackles on auscultation of the chest. First and second heart sounds are heard and there is an ejection systolic murmur grade 3/6 in the aortic distribution. An echocardiogram reveals a peak gradient of 32 mmHg across the aortic valve with generalised poor LV function and an ejection fraction of 35%.

How should this patient be managed?

A	Continue yearly follow-ups
B	6-monthly follow-ups
C	Discharge him from the clinic
D	Start him on digoxin
E	He needs replacement of the aortic valve +/- CABG

7496

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E	He needs replacement of the aortic valve +/- CABG

Explanation

The patient would need replacement of his aortic valve since he has become symptomatic. Normally, a gradient of between 50 and 60 mmHg is required for a surgical intervention of a stenotic aortic valve, but in this case the gradient across the aortic valve gradient would not be the sole determinant. Since the patient is symptomatic there is a high likelihood of left ventricular dysfunction, hence the lower than expected aortic gradient. The patient would also need an angiogram to determine the patency of his coronary arteries before surgery. If there is any coronary artery disease, both the valve replacement and bypass surgery could be carried out at the same time.

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On echocardiogram, a gradient of 60 mmHg is found across the aortic valve.

You explain to the patient that he will need a valve replacement. He would like to know the pros and cons of the different heart valves.

Which one of the following statements is true of prosthetic heart valves?

A	A tissue valve would be most suitable for this patient
B	Both tissue and metallic valves need anticoagulation for life
C	Tissue valves last as long as metallic valves
D	A metallic valve would be most suitable for this patient
E	Tissue valves last for 5 years on average

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Explanation

D	A metallic valve would be most suitable for this patient

A metallic valve would be most suitable for this patient because he is young. The negative side of metallic valves is that he will need anticoagulation for life. Data from a review published in 2012 also support the view that haemodynamic performance of mechanical valves and anti-coagulation may drive better outcomes versus tissue valves.

A	A tissue valve would be most suitable for this patient

Tissue valves do not require anticoagulation but on average they only last for about 10 years. Therefore, since the patient is young, a metal valve is more appropriate.

B	Both tissue and metallic valves need anticoagulation for life

Metallic heart valves require anticoagulation for life to prevent thromboembolism, while tissue valves do not require anticoagulation. The latter type does not increase the risk of thromboembolism.

C	Tissue valves last as long as metallic valves

Tissue valves on average last for about 10 years, so metallic valves last longer. Mechanical heart valves are more resistant than tissue valves to the constant demands placed on them, such as opening and closing with every heartbeat. The materials used in mechanical valves stand up well to wear and tear as opposed to tissue valves.

E	Tissue valves last for 5 years on average

Tissue heart valves on average last for about 10 years. Fortunately, there is adequate time to prepare for valve replacement. It is important to remember that any valve replacement surgery carries a significant risk of death, so a patient's life expectancy is a major criterion in considering whether to insert a tissue valve.

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A 74-year-old lady is referred by her general practitioner (GP) to the Emergency Department for worsening shortness of breath over the past 3-4 weeks. She is a known patient with dilated cardiomyopathy who has been stabilised on medication. She is on furosemide 80 mg od, bisoprolol 5 mg od, ramipril 10 mg od, aspirin 75 mg od and atorvastatin 80 mg nocte.

On examination she is dyspnoeic, with blood pressure 120/60 mmHg and pulse 92/min, regular. She has grossly swollen oedematous legs and her jugular venous pressure is raised. On auscultation, first and second heart sounds are heard and there is a grade III pan-systolic murmur radiating to the axilla. Auscultation of her chest reveals bi-basal crackles.

Investigations:

Hb	12.1 g/dl
MCV	86 fl
WCC	8×10^9/l
PLT	288×10^9/l
Na^+	141 mmol/l
K^+	3.0 mmol/l
Urea	8.1 mmol/l
Creatinine	131 μmol/l
CXR	Enlarged heart and bilateral small pleural effusions
ECG	Left bundle branch block (LBBB)

What would be the most appropriate next step in the long-term management of her condition?

A	Increase the dose of furosemide
B	Start her on digoxin
C	Start her on spironolactone
D	Start her on dobutamine
E	Urgent echocardiography

7545

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B Start her on digoxin

C Start her on spironolactone

D Start her on dobutamine

E Urgent echocardiography

Explanation

C Start her on spironolactone

Heart failure has a uniformly poor prognosis. More money is spent on it than any other illness. Spironolactone would be a good choice in this case, because it would raise the potassium and help remove the excess fluids on board. The Randomized Aldactone Evaluation Study (RALES) showed that spironolactone in a small dose of 25 mg reduced mortality by 30% when added to conventional therapy.

A Increase the dose of furosemide

Furosemide would offload fluid, but it would reduce the potassium further and therefore it is not a good choice in this case as the potassium is already low.

B Start her on digoxin

Digoxin would not be a good choice in this case because the patient is in sinus rhythm and has mild hypokalaemia. Results of the Digitalis Investigation Group (DIG) trial showed no difference in survival between the treatment arm and placebo.

D Start her on dobutamine

This patient's blood pressure is adequate and fluid removal is important, and therefore dobutamine would not be the best choice.

E Urgent echocardiography

Urgent echocardiography would not help symptoms and is likely to show heart failure with fluid overload, as suggested by the cardiomegaly and bilateral pleural effusion on the chest X-ray. She is already known to have dilated cardiomyopathy.

7545

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A 27-year-old man is referred to the Emergency Department by his general practitioner (GP) after having collapsed at home. This event had happened earlier in the day while he was sitting on the couch listening to music. He does not remember having any chest pains or shortness of breath. He just passed out and this was the first time it had ever happened. He has never had any serious illness in the past and his family history is unremarkable. He is not on any medication and he is not allergic to any medication. On examination, he is alert, comfortable, his blood pressure is 125/70 mmHg and his pulse is 74/min and regular. First and second heart sounds are heard and there is no murmur. His chest is clear. His central nervous system and abdomen are normal. His full blood count and biochemistry are normal.

Investigations:

Electrocardiogram (ECG)	ST elevation in V1–V3 and right bundle branch block (RBBB)
Chest X-ray	Normal
Echocardiography	Normal
Troponin T	Normal

What is the likely diagnosis?

A	Acute anterior myocardial infarction
B	Arrhythmogenic right ventricular dysplasia (ARVD)
C	Early repolarisation variant
D	Brugada syndrome (BrS)
E	Primary pulmonary hypertension

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Explanation

D Brugada syndrome (BrS)

In 1992, Brugada et al. described this novel clinical entity. It is an inherited form of cardiac arrhythmia, presenting with a typical electrocardiogram (ECG) pattern of ST segment elevation in leads V1–V3 and incomplete or complete right bundle branch block (RBBB). The underlying cause of BrS is a genetic defect in the SCN5A gene, which encodes the sodium channel controlling the depolarisation phase of the cardiac action potential. There are usually no structural abnormalities in Brugada syndrome (BrS) patients, and the disease may be defined as a pure electrical abnormality of myocardial cells. BrS manifests with syncope and cardiac arrest, typically occurring in the third or fourth decade of life, and usually at rest or during sleep. The implant of an implantable cardiac defibrillator (ICD) may markedly improve quality of life. Studies suggest that the majority of BrS patients are likely to remain asymptomatic and are at relatively low risk of relapsing.

A Acute anterior myocardial infarction

An anterior myocardial infarction will have electrocardiogram findings of ST elevation in leads V1–V6 with later pathological Q waves in the precordial leads V2 to V4–V5. Therefore in this scenario, the electrocardiogram is not consistent.

B Arrhythmogenic right ventricular dysplasia (ARVD)

ST segment elevation in right precordial leads and right RBBB has rarely been reported in arrhythmogenic right ventricular dysplasia (ARVD). Morphological analysis of the right ventricle should be carried out by echo and nuclear magnetic resonance (NMR) in order to exclude the presence of a structural cardiac abnormality.

C Early repolarisation variant

Early repolarisation describes ST elevation without underlying disease. It is commonly seen in young men. The characteristic findings are an upward concave elevation of the RS-T segment with distinct J waves. There is slurred downstroke of R waves or distinct J points, or both. The ECG findings in this scenario are not consistent with early repolarisation variant.

E Primary pulmonary hypertension

In primary pulmonary hypertension there is an elevated pulmonary artery pressure with no apparent cause. There is an increased pressure in the pulmonary vessels with symptoms of breathlessness, dizziness, syncope and leg swelling. There is a raised jugular venous pressure with pulmonary hypertension, of which there is no mention in this scenario.

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A 73-year-old female is brought into the Emergency Department by an ambulance because of a sudden onset of palpitations and shakes. This is the second time she has had such an experience. The first incidence only lasted about one minute, a month ago. She did not seek medical attention because she thought it was just one of those things that come with old age. The current episode has been going on for about an hour. She also has some shortness of breath but no dizziness. The ambulance crew noted that her blood pressure (BP) was very high, 230/110 mmHg. Her past medical history and family history are unremarkable.
On examination, she is dyspnoeic, sweating and shaking. Her blood pressure is 237/115 mmHg and her pulse is >150/min. Her chest is clear.

Investigations:

Electrocardiogram (ECG) monitor	Heart rate 188/min
12-lead electrocardiogram	Narrow complex tachycardia

You start the patient on high-flow oxygen (15 l) and you give her a fast intravenous dose of adenosine 6 mg. She experiences some chest tightness and the ECG monitor shows the heart rate slowing down. After a few minutes she calms down, the heart rate is 90/min, regular and the BP is 140/80mmHg.

What type of supraventricular tachycardia is this likely to be?

A	Atrial flutter
B	Atrial fibrillation
C	Multifocal atrial tachycardia
D	Sinus tachycardia
E	Atrioventricular re-entrant tachycardia (AVRT)

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Explanation

E	Atrioventricular re-entrant tachycardia (AVRT)

AVRT and atrioventricular nodal re-entrant tachycardia (AVNRT) may be terminated with adenosine. Other manoeuvres that may unmask underlying rhythms include valsalva manoeuvres and carotid sinus massage.

A	Atrial flutter

Transient atrioventricular (AV) block will unmask atrial flutter but is unlikely to terminate it.

B	Atrial fibrillation

Transient atrioventricular (AV) block will unmask atrial fibrillation but is unlikely to terminate it.

C	Multifocal atrial tachycardia

Transient atrioventricular (AV) block will unmask multifocal atrial tachycardia but is unlikely to terminate it.

D	Sinus tachycardia

Sinus tachycardia is unlikely to be treated with adenosine; there may be just transient AV block.

7548

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A 27-year-old male comes to the Emergency Department complaining of palpitations. In the past year, he has had some occasional palpitations only lasting a few seconds. This particular episode is different because it has been going on for about 45 min. He also complains of some slight shortness of breath but no dizziness. He was diagnosed with Wolff–Parkinson–White (WPW) syndrome a year ago when he presented with similar symptoms. On examination, he is apprehensive, his pulse is 130/min and his blood pressure is 125/70 mmHg. His chest is clinically clear.

Investigations:

Urea and electrolytes	Normal
Full blood count	Normal
Chest X-ray	Normal
Electrocardiogram (ECG)	Narrow complex regular tachycardia with heart rate of 150/min

What is the next appropriate immediate step in his management?

A	Digoxin
B	DC cardioversion
C	Infusion of amiodarone
D	Intravenous (IV) flecainide
E	IV verapamil

7549

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Normal Values

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What is the next appropriate immediate step in his management?

A	Digoxin
B	DC cardioversion
C	Infusion of amiodarone
D	Intravenous (IV) flecainide
E	IV verapamil

Explanation

B	DC cardioversion

DC cardioversion should be used early if the tachycardia is causing haemodynamic compromise. Beta-blockers may also be used. If symptoms are recurrent, patients should be referred for radio-frequency ablation, which is the definitive treatment.

A	Digoxin

Digoxin should be avoided as it may accelerate conduction down the accessory pathway. This could potentially lead to further cardiovascular compromise.

C	Infusion of amiodarone

Amiodarone is slightly less effective in achieving cardioversion in this situation than flecainide.

D	Intravenous (IV) flecainide

Intravenous flecainide or disopyramide should be used for chemical cardioversion, but it is not the treatment of choice if there is haemodynamic compromise.

E	IV verapamil

IV verapamil should be avoided as it may accelerate conduction down the accessory pathway. This could potentially lead to further cardiovascular compromise.

7549

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You have been called to the ward to review a patient who has suddenly changed condition. You quickly browse through the medical notes of the patient while walking up to his bed. He is a 60-year-old gentleman who was admitted the previous day with an acute coronary syndrome. His troponin was 0.03 IU (normal range <0.01) and his admission electrocardiogram (ECG) showed an ST segment depression of 1.0 mm in the inferior leads. He was started on aspirin 300 mg, glyceryl trinitrate (GTN) spray prn and enoxaparin 80 mg bd. His full blood count and urea and electrolytes are within normal limits.
When you examine him, he is dyspnoeic, his pulse is 140/min and his blood pressure (BP) is 90/45 mmHg. His chest is clinically clear and he is on high-flow oxygen (15 l). You give him 6 mg of adenosine, without any response. You repeat the same dose of 6 mg and then increase it to 12 mg. With the 12 mg dose, the heart rate (HR) on the monitor slows down to 105/min. A 12-lead ECG is taken at the same time.

Investigations:

Electrocardiogram (ECG)	Flutter waves best seen in the inferior leads and V1

After a couple of minutes, the HR shoots back to 150/ min. You recheck his BP that is still low at 92/50 mmHg. The patient starts complaining of chest tightness.

How would you control this man's tachycardia?

A	DC cardioversion
B	Beta-blockers
C	Digoxin
D	Intravenous (IV) flecainide
E	Verapamil

7550

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Calculator

Normal Values

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How would you control this man's tachycardia?

A	DC cardioversion
B	Beta-blockers
C	Digoxin
D	Intravenous (IV) flecainide
E	Verapamil

Explanation

A	DC cardioversion

DC cardioversion is the therapy of choice as flutter can be resistant to pharmacological therapy. Additionally, given that he has been admitted with ACS and his initial systolic was only 90 mmHg, cardioversion versus flecainide or verapamil would be the most appropriate option. This patient would need to be sedated or have general anaesthesia before cardioverting him. Very low energies are needed for cardioversion (50–100 J).

B	Beta-blockers

Beta-blockers would slow down the rate but would not cardiovert the patient, and therefore this is an incorrect option.

C	Digoxin

Flutter can be resistant to pharmacological therapy, and therefore digoxin would not be the appropriate treatment.

D	Intravenous (IV) flecainide

Given that he has a history of myocardial ischaemia, and the results of the CARDS study, flecainide should be avoided.

E	Verapamil

Given that he has been admitted with ACS, and his initial systolic was only 90 mmHg, verapamil would not be a good option compared with cardioversion.

7550

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You accompany a patient for an exercise test. This was the patient's 7th day post-myocardial infarction. He had an inferolateral myocardial infarction and he was having an exercise test for the purpose of risk stratification. At rest, his blood pressure (BP) was 130/75 mmHg. He was able to manage 8 min on the treadmill using the Bruce protocol. He could have gone on for some more minutes but was limited by shortness of breath and not chest pain. At maximum exercise, his BP was 160/72 mmHg.

Investigations:

Urea and electrolytes	Normal
Full blood count	Normal
Chest X-ray	Normal
Resting Electrocardiogram (ECG)	Q waves in leads II, III, aVF

How would you best describe this BP response to exercise?

A	Both systolic and diastolic responses were abnormal
B	The diastolic response was normal but not the systolic
C	The systolic response was excessive
D	The systolic response was normal but not the diastolic
E	Both systolic and diastolic responses were normal

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Normal Values

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C	The systolic response was excessive
D	The systolic response was normal but not the diastolic
E	Both systolic and diastolic responses were normal

Explanation

E Both systolic and diastolic responses were normal

With exercise, systolic pressure progressively increases until maximum exercise. Diastolic BP remains the same and may decrease slightly with progressive exercise. With heart disease, abnormalities in BP response to exercise are common. A fall in blood pressure, failure to rise or excessive rise (systolic >250 mmHg) in blood pressure is an indication to terminate the exercise test.

A Both systolic and diastolic responses were abnormal

With exercise, systolic pressure progressively increases until maximum exercise. Diastolic BP remains the same and may decrease slightly with progressive exercise. This is the case in this scenario, and therefore responses are normal.

B The diastolic response was normal but not the systolic

With exercise, systolic pressure progressively increases until maximum exercise – it is a normal response in this case.

C The systolic response was excessive

Providing systolic rises to <250 mmhg with exercise, then this is not excessive.

D The systolic response was normal but not the diastolic

Diastolic BP remains the same and may decrease slightly with progressive exercise, as in this case, so it is a normal diastolic response.

7551

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Responses Correct:	0
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Your registrar has asked you do some blood gases on a patient with chest pain who is on the coronary care unit. There is a previous history of deep vein thrombosis 5 years ago. The patient is a 65-year-old lady who just presented with severe chest pain that started 6 h earlier. The chest pain was central, radiated to the neck and lasted for about 45 min. She is still having some chest pains but not very severe. Her admission electrocardiogram (ECG) revealed sinus rhythm with T wave inversion in the anterior chest leads.

While trying to draw some blood, the patient suddenly becomes restless and starts complaining of shortness of breath. The ECG monitor shows a heart rate of 188/min and her blood pressure (BP) is 105/60 mmHg. You immediately start the patient on high-flow oxygen using a mask and request a 12-lead ECG. This ECG reveals a narrow complex tachycardia.

What would you immediately do for this patient?

A	DC cardioversion
B	Give the patient a bolus dose of intravenous (IV) lidocaine 100 mg
C	Start the patient on amiodarone infusion of 300 mg in 1 h
D	Give the patient a bolus dose of IV adenosine 6 mg
E	Start patient on oral beta-blockade

7552

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Calculator

Normal Values

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D	Give the patient a bolus dose of IV adenosine 6 mg
E	Start patient on oral beta-blockade

Explanation

D	Give the patient a bolus dose of IV adenosine 6 mg

This lady is likely to be having an acute coronary syndrome. Giving her a fast intravenous (IV) dose of adenosine 6 mg and repeating it if there is no response is the most appropriate immediate action. The patient's response to adenosine would depend on the underlying arrhythmia. In rare cases adenosine has been reported to cause destabilisation of VT and lead to further deterioration of blood pressure and heart rate, but on the balance of probabilities adenosine would still be the best course of action here. The response to giving adenosine in the following situations is tabulated here.

Sinus tachycardia	Transient atrioventricular (AV) block
Atrial fibrillation	Transient AV block
Atrial flutter	Transient AV block
Atrioventricular nodal re-entrant tachycardia (AVNRT)	May terminate
Atrioventricular re-entrant tachycardia (AVRT)	May terminate
Ventricular tachycardia	Likely to have no effect

A	DC cardioversion

Her blood pressure (BP) is 105/60 mmHg and so she is not haemodynamically compromised; therefore, giving DC cardioversion is not required and adenosine should be tried first.

B	Give the patient a bolus dose of intravenous (IV) lidocaine 100 mg

Her blood pressure (BP) is 105/60 mmHg and so she is not haemodynamically compromised; giving lidocaine is incorrect.

C	Start the patient on amiodarone infusion of 300 mg in 1 h

Amiodarone would be more appropriate for ventricular tachycardia.

E	Start patient on oral beta-blockade

Oral beta-blockers are slow to act and could worsen any heart failure in the acute setting.

7552

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A 23-year-old female presents to the Emergency Department with collapse. She was playing tennis when she suddenly fell to the ground and lost consciousness for a short period of time. She had a very brief period of palpitations and then everything just blacked out. This is her second episode of collapse: the first happened about a year ago when she suddenly collapsed while jogging. Extensive investigations were carried out on the first occasion but none revealed anything diagnostic. The investigations included: electrocardiogram (ECG), 24 h ECG monitor, echocardiography, chest X-ray (CXR), routine full blood count (FBC) and biochemistry, which were all normal. There is no past medical history of any serious illness apart from syncope. She is not on any medication. On examination she is alert, her blood pressure is 120/65 mmHg and pulse 70/min and regular. Cardiovascular, respiratory, nervous and abdominal examinations are all normal.

Investigations:

Urea and electrolytes	Normal
Full blood count	Normal
Chest X-ray	Normal
Electrocardiogram (ECG)	QT prolongation: QTc 0.49 s

How would you manage this young lady?

A	Electrophysiological studies
B	Insert a cardioverter-defibrillator
C	Start her on a beta-blocker
D	Start her on amiodarone
E	Start her on a calcium channel blocker

7553

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Calculator

Normal Values

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A 23-year-old female presents to the Emergency Department with collapse. She was playing tennis when she suddenly fell to the ground and lost consciousness for a short period of time. She had a very brief period of palpitations and then everything just blacked out. This is her second episode of collapse: the first happened about a year ago when she suddenly collapsed while jogging. Extensive investigations were carried out on the first occasion but none revealed anything diagnostic. The investigations included: electrocardiogram (ECG), 24 h ECG monitor, echocardiography, chest X-ray (CXR), routine full blood count (FBC) and biochemistry, which were all normal. There is no past medical history of any serious illness apart from syncope. She is not on any medication. On examination she is alert, her blood pressure is 120/65 mmHg and pulse 70/min and regular. Cardiovascular, respiratory, nervous and abdominal examinations are all normal.

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Full blood count	Normal
Chest X-ray	Normal
Electrocardiogram (ECG)	QT prolongation: QTc 0.49 s

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A	Electrophysiological studies
B	Insert a cardioverter-defibrillator
C	Start her on a beta-blocker
D	Start her on amiodarone
E	Start her on a calcium channel blocker

Explanation

C Start her on a beta-blocker

Long-QT syndrome (LQTS) is a congenital disorder characterised by a prolongation of the QT interval on electrocardiogram (ECG) and a propensity to ventricular tachyarrhythmias, which may lead to syncope, cardiac arrest or sudden death. LQTS is caused by mutations of cardiac ion channel genes, and two forms have been recognised: Romano–Ward syndrome and Jervell and Lang–Nielsen. Beta-blockers are the drugs of choice for patients with LQTS. The protective effect of beta-blockers is related to their adrenergic blockade diminishing the risk of cardiac arrhythmias.

A Electrophysiological studies

Electrophysiological studies are minimally invasive procedures that test the electrical conduction system of the heart to assess its electrical activity and conduction pathways. It is not needed in this scenario, as we know that QT is prolonged and it has a certain set of potential differentials.

B Insert a cardioverter-defibrillator

Implantation of cardioverter-defibrillators appears to be the most effective therapy for high-risk patients, and left cervicothoracic stellectomy is another antiadrenergic therapeutic measure used in high-risk patients with LQTS. High risk in this context is usually described by a history of collapse, although given this woman's age she may prefer a trial of beta-blockade before committing to an implantable cardioverter-defibrillator.

D Start her on amiodarone

Amiodarone will prolong the QT interval, so it would not be given in this case.

E Start her on a calcium channel blocker

Calcium channel blockers are not useful in this case of prolonged QT interval; in fact, some calcium channel blockers are responsible for prolongation of QT interval.

7553

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You have just finished resuscitating a 69-year-old lady who was in ventricular fibrillation (VF). You managed to cardiovert her back to sinus rhythm after three shocks at 360 J. This is the second time she has had VF. The first time was about 6 h ago and she was cardioverted back to sinus rhythm. This lady had suffered an anterior myocardial infarction (MI) and was thrombolysed two days previously. She is taking aspirin 75 mg, isosorbide mononitrate 30 mg bd and atenolol 50 mg od.

Investigations:

Haemoglobin (Hb)	14.1 g/dl
White cell count (WCC)	12.3×10^9
Platelets	203×10^9
Mean corpuscular volume (MCV)	80.1 fl
Sodium	132 mmol/l
Potassium	4.1 mmol/l
Urea	7.2 mmol/l
Creatinine	121 µmol/l
$P(O_2)$	23 kPa
$P(CO_2)$	3.1 kPa
PH	7.29

What prophylactic medication would you start her on to prevent further arrhythmias?

A	Amiodarone infusion
B	Flecainide
C	Lidocaine infusion
D	Propafenone
E	Verapamil

7554

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Normal Values

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Investigations:

Haemoglobin (Hb)	14.1 g/dl
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Platelets	203 × 10^9
Mean corpuscular volume (MCV)	80.1 fl
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Urea	7.2 mmol/l
Creatinine	121 μ mol/l
P(O_2)	23 kPa
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A	Amiodarone infusion
B	Flecainide
C	Lidocaine infusion
D	Propafenone
E	Verapamil

Explanation

A	Amiodarone infusion

Amiodarone infusion should be started (300 mg over the first hour and then 900 mg over the next 23 h), and then oral doses should be continued.

B	Flecainide

Flecainide has been shown to be associated with increased mortality in studies that have been done in patients with arrythmias post-myocardial infarction. and should be avoided.

C	Lidocaine infusion

Lignocaine is negatively inotropic and would therefore be a subsidiary choice in this situation.

D	Propafenone

Propafenone has been shown to be associated with increased mortality in studies that have been done in patients with arrythmias post-myocardial infarction, and should be avoided.

E	Verapamil

Verapamil is negatively inotropic, so would not be a good choice in this scenario.

7554

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A 72-year-old man comes for a review in the cardiology clinic. He had an inferolateral myocardial infarction that was thrombolysed 4 weeks ago. He had recovered uneventfully and was discharged on the fifth day post-myocardial infarction (MI). Now he comes to your clinic and he is asymptomatic. Regular medication includes atenolol 100 mg and ramipril 10 mg. On examination his blood pressure is 135/80 mmHg and his pulse is 40/min and regular.

Investigations:

Echocardiogram	Normal
Electrocardiogram (ECG)	Sinus bradycardia with RR interval of 2.0 s, Q waves in leads II, III, aVF, V5–V6

What would you do for this patient?

A	Give adrenaline
B	Give atropine
C	Give isoprenaline
D	Insert a permanent pacemaker
E	Reduce his atenolol

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What would you do for this patient?

A	Give adrenaline
B	Give atropine
C	Give isoprenaline
D	Insert a permanent pacemaker
E	Reduce his atenolol

Explanation

E	Reduce his atenolol

This man is likely to be over-beta-blocked. Management of choice would be to reduce his atenolol to 50 mg and arrange follow-up with his GP.

A	Give adrenaline

Adrenaline is given in a number of conditions, including anaphylaxis, cardiac arrest and superficial bleeding. Side effects include shakiness, anxiety and sweating. It is not a cardiac arrest situation in this scenario and therefore adrenaline is the wrong option.

B	Give atropine

Atropine is given for reversing bradycardia and hypotension in beta-blocker overdose. This patient's blood pressure is normal, and therefore although he is over-beta-blocked there is no need for urgent reversal; instead, reduction in atenolol will be sufficient.

C	Give isoprenaline

Isoprenaline is a medication used for treatment of bradycardia, heart block and rarely for asthma. This patient's blood pressure is normal, and therefore although he is over-beta-blocked, there is no need for urgent reversal; instead, reduction in atenolol will be sufficient.

D	Insert a permanent pacemaker

Pacemaker insertion may be used for treatment of symptomatic complete heart block. In this scenario, the heart rate would improve with reduction in atenolol. There is no heart block here.

7555

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Responses Correct:	0
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Responses Total:	39
Responses - % Correct:	0%

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You are reviewing a 70-year-old lady who you had seen in the cardiology clinic last week. You had requested for a 24 h Holter monitor for her. She had an inferior myocardial infarction that was thrombolysed 4 weeks ago. She had recovered uneventfully and was discharged on the fifth day post-myocardial infarction (MI). She came to your clinic last week with symptoms of palpitations and dizziness occurring simultaneously. She would get those episodes about twice a day in the preceding 2 weeks. On examination, her blood pressure is 130/70 mmHg, her pulse 72/min and regular. Her jugular venous pressure is not raised, first and second heart sounds are heard and there are no murmurs. Her chest is clinically clear. Her full blood count and blood biochemistry are normal.

Investigations:

Chest X-ray	Normal
Electrocardiogram (ECG)	Normal sinus rhythm with Q waves in II, III and aVF. The PR interval is prolonged.
Echocardiography	Normal findings
24 h Holter monitor	Two episodes of bradycardia with a heart rate of 30/min; during these periods P waves appear unrelated to the QRS complexes. These episodes coincided with the symptoms

How are you going to manage this lady?

A	Calcium channel blocker
B	Permanent pacemaker
C	Do nothing
D	Electrophysiology studies
E	Start a beta-blocker

7556

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Normal Values

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You are reviewing a 70-year-old lady who you had seen in the cardiology clinic last week. You had requested for a 24 h Holter monitor for her. She had an inferior myocardial infarction that was thrombolysed 4 weeks ago. She had recovered uneventfully and was discharged on the fifth day post-myocardial infarction (MI). She came to your clinic last week with symptoms of palpitations and dizziness occurring simultaneously. She would get those episodes about twice a day in the preceding 2 weeks. On examination, her blood pressure is 130/70 mmHg, her pulse 72/min and regular. Her jugular venous pressure is not raised, first and second heart sounds are heard and there are no murmurs. Her chest is clinically clear. Her full blood count and blood biochemistry are normal.

Investigations:

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Echocardiography	Normal findings
24 h Holter monitor	Two episodes of bradycardia with a heart rate of 30/min; during these periods P waves appear unrelated to the QRS complexes. These episodes coincided with the symptoms

How are you going to manage this lady?

A Calcium channel blocker

B Permanent pacemaker

C Do nothing

D Electrophysiology studies

E Start a beta-blocker

Explanation

B Permanent pacemaker

This lady has symptomatic complete heart block and she would definitely benefit from a pacemaker. The frequency of events and the heart rate fit best with complete heart block rather than episodes of ischaemia.

A Calcium channel blocker

Calcium channel blockers are negatively inotropic and may cause third-degree heart block; these therefore have no role in this scenario as this patient has symptomatic complete heart block.

C Do nothing

This patient has symptomatic complete heart block; doing nothing will not be appropriate as her symptoms will persist.

D Electrophysiology studies

Electrophysiological studies are minimally invasive procedures that test the electrical conduction system of the heart to assess its electrical activity and conduction pathways. The 24 h Holter readings are already consistent with complete heart block, so there is no need for electrophysiology studies.

E Start a beta-blocker

This patient already has bradycardia, and therefore adding a beta-blocker will exacerbate problem and will be potentially harmful.

7556

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Responses Correct:	0
Responses Incorrect:	40
Responses Total:	40
Responses - % Correct:	0%

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A 70-year-old lady comes to your clinic for follow-up. She is a known patient with stable heart failure (NYHA II) due to ischaemic cardiomyopathy. She has chronic atrial fibrillation (AF) and has been anticoagulated with warfarin. Other medications include: digoxin 125 µg od, furosemide 40 mg od, ramipril 2.5 mg od and diltiazem 60 mg bd. Her resting pulse is 61 with a blood pressure of 132/82 mmHg. Today her international normalised ratio (INR) was 2.7. She would like to know whether there would be any benefits if she was cardioverted to normal sinus rhythm.

How would you advise this lady?

A	Rate control is better than rhythm control with respect to stroke
B	She should be referred for electrical cardioversion
C	She should be switched to amiodarone in an attempt to cardiovert her
D	Rhythm control has no survival benefit over a rate control strategy
E	She would benefit from ivabradine

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A 70-year-old lady comes to your clinic for follow-up. She is a known patient with stable heart failure (NYHA II) due to ischaemic cardiomyopathy. She has chronic atrial fibrillation (AF) and has been anticoagulated with warfarin. Other medications include: digoxin 125 µg od, furosemide 40 mg od, ramipril 2.5 mg od and diltiazem 60 mg bd. Her resting pulse is 61 with a blood pressure of 132/82 mmHg. Today her international normalised ratio (INR) was 2.7. She would like to know whether there would be any benefits if she was cardioverted to normal sinus rhythm.

How would you advise this lady?

A	Rate control is better than rhythm control with respect to stroke
B	She should be referred for electrical cardioversion
C	She should be switched to amiodarone in an attempt to cardiovert her
D	Rhythm control has no survival benefit over a rate control strategy
E	She would benefit from ivabradine

Explanation

D	Rhythm control has no survival benefit over a rate control strategy

Current evidence suggests that rhythm control has no benefit over a rate control strategy, and indeed there was a trend to decreased mortality and decreased cardiovascular events in patients treated with a rate control intervention.

A	Rate control is better than rhythm control with respect to stroke

Any difference between rate control and rhythm control on outcomes did not reach statistical significance.

B	She should be referred for electrical cardioversion

In this situation, with dilated cardiomyopathy, electrical cardioversion is unlikely to be successful and would not impact on outcomes.

C	She should be switched to amiodarone in an attempt to cardiovert her

Amiodarone is highly unlikely to help her attain sinus rhythm, and carries significant risk with respect to long-term side effects including photosensitivity and thyroid dysfunction.

E	She would benefit from ivabradine

Patients who benefit most are those with persistent resting tachycardia who are suffering from either heart failure or angina.

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An anxious 31-year-old barrister presents to his GP complaining of fainting episodes which have a recent onset. He does not attribute his faints to any particular activity, and sometimes he has noticed light-headedness even as he has changed position at rest. On further questioning, he admits to having felt increasingly tired and short of breath with minimal exertion. His appetite has decreased and he has lost about 5 kg of weight in the preceding 2 months. He had been otherwise fit and well and is not on any medication. He is a non-smoker. He admits to being very concerned since his father died suddenly at a similar age to himself, but he does not know the cause of death. Positive findings on examination of the patient include clubbing of his fingers and a raised JVP. Auscultation of the heart reveals a loud first heart sound, a third heart sound and a systolic murmur at the apex. His blood pressure is 142/82 mmHg. Neurological examination is normal.

What is the most likely diagnosis?

A	Infective endocarditis
B	Takayasu's disease
C	Rheumatic fever
D	Atrial myxoma
E	Bornholm disease

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D	Atrial myxoma
E	Bornholm disease

Explanation

D Atrial myxoma

An atrial myxoma is the most common primary heart tumour and produces symptoms either through distant embolisation or mechanical interference with cardiac function. Three-quarters of cases of atrial myxoma occur in females, and sudden death may occur in 15% of patients. Patients may experience symptoms related to left- or right-sided heart failure. Exertional dyspnoea is present in three-quarters of patients. Dizziness or syncope results from the atrial myxoma obstructing the mitral valve. The patient may also have constitutional symptoms that include fever, weight loss and arthralgias. On examination, a loud first heart sound is often heard due to a delay in mitral valve closure due to the prolapse of the tumour into the mitral valve orifice. However, atrial myxoma can cause a variety of findings on cardiac auscultation: for example, diastolic tumour 'plop', systolic murmur if tricuspid regurgitation occurs, or a diastolic rumble if mitral valve obstruction is present. Although most cases of atrial myxoma are sporadic, an autosomal dominant variety may also exist within families.

A Infective endocarditis

The more prolonged period of symptoms seen here, without more marked features of sepsis, is less consistent with a diagnosis of infective endocarditis versus atrial myxoma.

B Takayasu's disease

Takayasu's arteritis is an idiopathic arteritis causing narrowing of the proximal innominate, carotid and subclavian arteries and commonly affects females.

C Rheumatic fever

There is no history of antecedent streptococcal infection to suggest rheumatic fever.

E Bornholm disease

Bornholm's disease is intercostal muscle pain associated with Coxsackie B virus infection.

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Responses Total:	42
Responses - % Correct:	0%

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A pre-registration house officer asks for advice about an ECG recording he has been shown from a young 20-year-old female patient admitted unconscious after taking a paracetamol overdose. The ECG showed sinus rhythm, but with a P-axis of +120 degrees and prominent QRS amplitudes in the right leads that diminish in size over the left precordial leads. No other abnormalities were noted. After seeing the ECG the registrar becomes interested in examining the patient.

Which of the following is seen with increased frequency in patients with her underlying condition?

A	Colon cancer
B	Bronchiectasis
C	Haemolytic anaemia
D	Hypertrophic obstructive cardiomyopathy
E	Wolff-Parkinson-White syndrome

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A	Colon cancer
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Explanation

B	Bronchiectasis

This patient has dextrocardia, and so the cardiac apex now points rightwards with the morphological right atrium and right ventricle now being on the left. It is commonly associated with reversal in the position of the abdominal organs, known as situs inversus. Dextrocardia is a rare condition and occurs with equal frequency in males and females. The classical features on an ECG are inverted P-waves in lead I, a shift of the P-axis (usually about +120 degrees) and reversed R-wave progression. Reverse placement of the precordial leads on the right chest at sites corresponding to the left chest positions corrects this trend. Typically patients have a normal life expectancy if no cardiac anomalies are present. Bronchiectasis is seen with increased frequency in patients with dextrocardia, as part of Kartagener syndrome, which is the combination of bronchiectasis, chronic sinusitis, subfertility and situs inversus with dextrocardia.

A	Colon cancer

Colon cancer is associated with a number of adenomatous polyposis syndromes such as Gardener, which follows an autosomal dominant pattern of inheritance.

C	Haemolytic anaemia

Haemolytic anaemia is associated with a range of inherited conditions including hereditary spherocytosis, elliptocytosis and G6PD deficiency.

D	Hypertrophic obstructive cardiomyopathy

HOCM is not associated with dextrocardia although pulmonary hypertension may be, because of chronic chest disease due to immotile cilia.

E	Wolff-Parkinson-White syndrome

WPW syndrome and other conditions associated with tachyarrhythmias are not seen with increased frequency in dextrocardia.

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Responses Correct:	0
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Responses Total:	43
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A 28 year old man with a family history of hypertrophic cardiomyopathy (HOCM) is undergoing a medical examination for private health insurance cover. A routine ECG is performed by the examining physician.

Which of the following abnormalities seen on the ECG would be most suggestive of HOCM?

A	Atrial ectopics
B	Sinus bradycardia
C	Sinus tachycardia
D	Ventricular ectopics
E	PR prolongation

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D	Ventricular ectopics
E	PR prolongation

Explanation

E	PR prolongation

Common ECG findings in patients with HOCM include LV hypertrophy, atrial enlargement, ST-T-segment abnormalities, right- or left-axis deviation, PR prolongation, sinus bradycardia with ectopic atrial rhythm and bundle branch block. Ventricular fibrillation is responsible for the sudden death in 80% of these patients. HOCM can also be associated with Wolff-Parkinson-White syndrome.

Hypertrophic cardiomyopathy (HOCM) is an autosomal dominant condition with variable penetrance characterised by asymmetrical myocardial hypertrophy. Although any region of the left ventricle (LV) can be involved, the hypertrophy frequently involves the interventricular septum resulting in LV outflow tract obstruction. The condition is slightly more common in males, with the most common age of presentation being in the third decade of life. It is a leading cause of sudden death in otherwise fit and healthy young adults. Indeed, sudden death may be the first clinical manifestation of the disease.

A	Atrial ectopics

Atrial ectopics are common and benign unless other signs of structural abnormality on the ECG are identified.

B	Sinus bradycardia

Sinus bradycardia may well be as a result of physical training in a man of this age group, and not indicative of any underlying cardiovascular pathology.

C	Sinus tachycardia

Sinus tachycardia in this situation may be as a result of the ‘white coat effect’, driven by stress on attending for the medical.

D	Ventricular ectopics

Although ventricular ectopics can be associated with a structural cardiac abnormality they are also, like atrial ectopics, a natural phenomenon with no link to outcomes for many patients.

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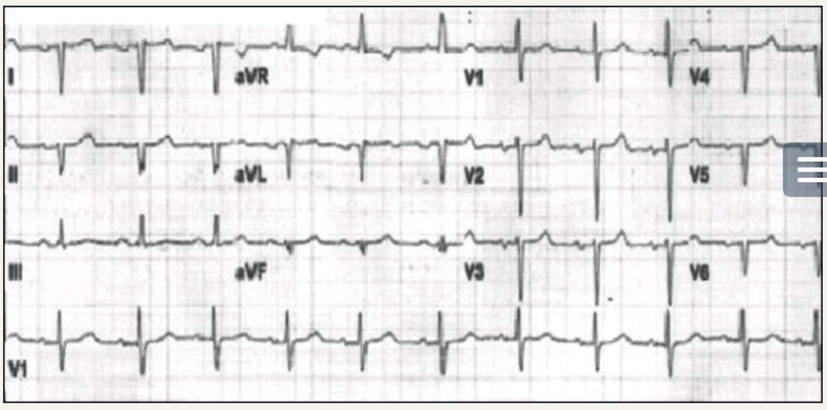
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Responses - % Correct:	0%

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You are a general medical senior house officer in a district general hospital. You are asked to see a 20-year-old man in the Emergency Department who is breathless. He gives a history of recent air travel to South America within the last 10 days. He denies any past medical history but says that he has a chronic smokers' cough. The patient is not taking any regular medications.
On examination, he is a thin man with tachypnoea at rest. His baseline observations are blood pressure 120/80 mmHg, heart rate 100 beats/min, oxygen saturations 89% on room air and temperature 38.5°C. He is noted to have bi-basal crepitations and ill-defined heart sounds on auscultation. Routine bloods reveal an elevated white blood cell count and CRP.

An electrocardiogram (ECG) done on admission is shown below.



What is the next step in management?

A	Echocardiogram to rule out an atrial septal defect (ASD)
B	Organise a VQ scan and commence low-molecular weight heparin
C	Measure alpha-1 antitrypsin level and arrange a thoracic CT
D	Organise a chest X-ray and commence antibiotic therapy
E	Perform delta F508 genetic screening

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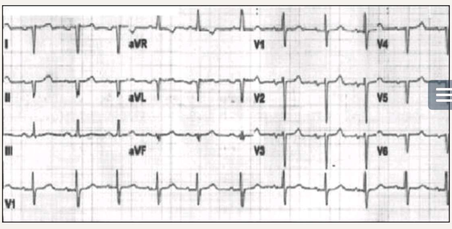
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Explanation

D Organise a chest X-ray and commence antibiotic therapy

Although the story is of a young man having travelled to South America, the faint heart sounds, 'chronic smokers' cough and abnormal ECG all point towards dextrocardia, bronchiectasis and therefore Kartagener syndrome.

The clinical features are consistent with an acute lower respiratory tract infection.

The ECG with leads in the usual precordial position reveals inverted P-waves in lead I with a negative major QRS deflection. Upright P-waves with a positive QRS deflection are seen in lead aVR with mirror image findings in lead aVL, and an abnormal precordial progression of R wave from lead V1 to V6.

A Echocardiogram to rule out an atrial septal defect (ASD)

The most pressing problem here is the likely acute lower respiratory tract infection, with antibiotic therapy the key intervention. An ASD is less likely versus dextrocardia, for which the ECG findings are very consistent.

B Organise a VQ scan and commence low-molecular weight heparin

The pyrexia and abnormal chest findings on auscultation make respiratory tract infection more likely as the underlying cause of his symptoms versus a pulmonary embolism.

C Measure alpha-1 antitrypsin level and arrange a thoracic CT

Alpha-1 antitrypsin deficiency is associated with emphysema rather than bronchiectasis.

E Perform delta F508 genetic screening

Some patients who are heterozygous for the cystic fibrosis mutation are at increased risk of bronchiectasis, although in this case the ECG changes seen here would not be expected.

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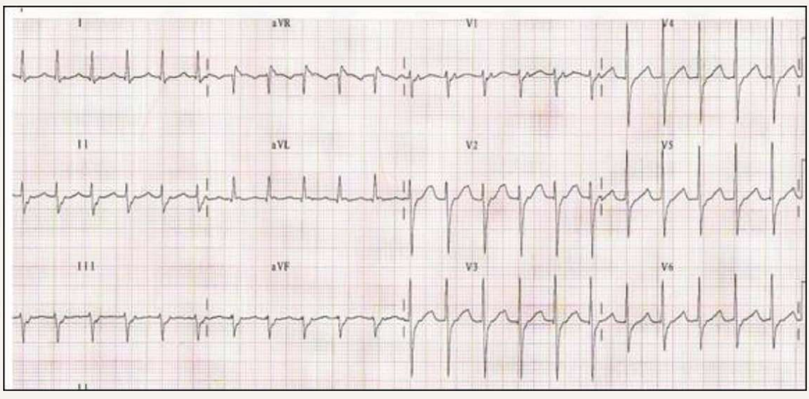
Session Progress

Responses Correct:	0
Responses Incorrect:	45
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Responses - % Correct:	0%

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You are the night on-call core trainee for general medicine. The casualty officer has called asking for advice. A young man has presented with sudden onset of palpitations of 10 h duration. He has a past medical history of palpitations but cannot remember the name of the condition. He has been told to come to the Emergency Department if they occur and do not settle within a short space of time. At present he describes some chest discomfort but feels well otherwise. His blood pressure is 110/75 mmHg, heart rate 170 beats/min, oxygen saturations 96% on air.
The casualty trainee describes his electrocardiogram (ECG) as fast and regular, with left bundle branch block. He tells you that his troponin-T on admission is mildly raised at 0.18 ng/ml (normal <0.01 ng/ml). He asks you whether, given his story of chest pain and raised troponin, he should transfer for urgent PCI.

You decide to review the patient. The ECG on admission is shown below.



After administering adenosine, the patient reverts to sinus rhythm.

What drug(s) would you commence to prevent this happening again?

A	No further intervention needed
B	Regular digoxin
C	Regular nifedipine
D	Regular bisoprolol
E	Regular flecainide

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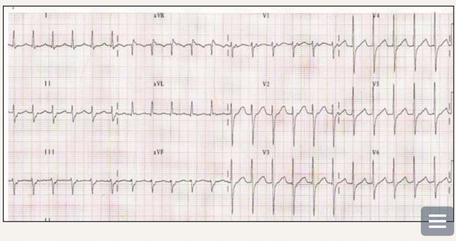
Calculator

Normal Values

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Explanation

D	Regular bisoprolol

This man has atrioventricular nodal re-entry tachycardia (AVNRT). It is the most common supraventricular tachycardia, twice as common in females as in males - the incidence is 1–3 per 1000. The electrocardiogram (ECG) shows the characteristic RSR-pattern QRS tachycardia with the P-waves incorporated into the QRS complex. Medical treatment encompasses drugs that block the atrioventricular node, but there is a risk of 1:1 conduction via the fast pathway. Therefore, care needs to be taken to prescribe a beta-blocker and add an agent such as flecainide to block this conduction if required. Small elevations in troponin are occasionally seen in this situation, but there are no ECG changes to suggest a myocardial infarction.

A	No further intervention needed

This patient has suffered a prolonged episode of symptomatic tachycardia, and prophylaxis to prevent a further episode occurring is therefore advised.

B	Regular digoxin

Digoxin has no effect in maintaining sinus rhythm, and although it is a useful symptomatic intervention in patients with fast AF, it has no role here. Studies suggest it may actually increase the risk of MACE events in some individuals with a history of previous ischaemic heart disease.

C	Regular nifedipine

Nifedipine is a vasodilating calcium channel antagonist, meaning it may actually increase heart rate. It's therefore not the best option here.

E	Regular flecainide

Flecainide is the usual second-choice option for patients who fail to tolerate beta blockade or for whom it is contraindicated.

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You are a care of the elderly senior house officer. The Emergency Department registrar refers an 80-year-old man to you, who presented with light-headedness and palpitations. He gives a 2-year history of palpitations associated with dizziness that can occur any time during the day. He cannot identify any associated aggravating or alleviating factors. There is a history of hypertension and benign prostatic hypertrophy. His current medications are bendroflumethiazide 2.5 mg daily, atenolol 100 mg daily and tamulosin 0.4 mg daily. The presentation electrocardiogram (ECG) shows sinus rhythm with a rate of 56 beats/min. A lying and standing blood pressure shows 5 mmHg systolic variation.

You decide to admit this man for observations and you ask the nurses to keep him on cardiac telemetry.



The following morning you review the overnight rhythm strips (selected portions above) and are surprised to find the significant changes.

What is the next step in your management?

A	Add digoxin to the current regime
B	Reduce the dose of beta blocker and review in 6 weeks
C	Stop the beta blocker and review in 6 weeks
D	Reduce the dose of atenolol and arrange for a 72h Holter monitor
E	Reduce the dose of atenolol and arrange for pacemaker insertion

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You are a care of the elderly senior house officer in clinic. A 70-year-old man comes to see you in clinic. Looking through his medical notes you see that he has had a single ventricular lead (VVIR) pacemaker implanted 6 years previously for episodes of sinus arrest. At the time he had symptoms of sudden collapse with pre-syncope. Since the pacemaker he has not experienced such symptoms but on occasions he has been tired and listless, with a feeling of pounding in the neck or chest. His wife says that she can sometimes see large, pulsating veins in his neck. The symptoms last only a matter of seconds and are associated with chest pain or palpitations. He has mentioned this on several occasions in previous clinics but has always been reassured that nothing was wrong, and to sit down when it occurs. Otherwise, he is well in himself with a mild degree of prostatism.

On examination, there is nil of note in his cardiovascular or respiratory characteristics. In his neurological system, the power is equal in both upper and limbs with intact reflexes. His plantar responses are down-going.

The interrogation of the pacemaker has shown no adverse complications. The battery life is good and the lead impedance is satisfactory.

What is your advice to this gentleman?

A	He needs his VVIR pacemaker box changed
B	He needs repositioning of his pacemaker lead
C	He needs a DDDR upgrade of the VVIR pacemaker
D	He needs a tilt test
E	He needs treatment with amiodarone

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C	He needs a DDDR upgrade of the VVIR pacemaker
D	He needs a tilt test
E	He needs treatment with amiodarone

Explanation

C	He needs a DDDR upgrade of the VVIR pacemaker

This is pacemaker syndrome. The VVIR prefix denotes a single ventricular lead pacemaker, which senses and paces the ventricle and inhibits responses to a sensed event. An untimely contraction of the atria caused by retrograde conduction of the ventricular pacemaker impulse mimics complete heart block, and the pounding is the feeling of atria contracting against a closed tricuspid valve causing cannon waves in the neck. The treatment is to upgrade the system to a dual-chamber pacemaker, which allows the atria to sense any retrograde electrical impulse and thus inhibiting native atrial depolarisation.

A	He needs his VVIR pacemaker box changed

Changing the VVIR pacemaker box for another one won't impact on the risk of pacemaker syndrome, and it is therefore not advised.

B	He needs repositioning of his pacemaker lead

It isn't failure of capture that is driving pacemaker syndrome but retrograde conduction of the ventricular pacemaker impulse, and hence lead repositioning won't resolve the problem.

D	He needs a tilt test

The tilt table test is used to diagnose syncope related to autonomic nervous system dysfunction.

E	He needs treatment with amiodarone

Only a dual-chamber pacemaker will lead to resolution of this patient's symptoms.

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A general practitioner (GP) calls you up. He is asking for advice regarding a 25-year-old Caucasian man who came to his surgery complaining of chest pain, which was subsequently diagnosed as musculoskeletal in origin. During his initial assessment the patient's blood pressure was 150/105 mmHg and on subsequent checks it has remained around this level. His BMI is normal at 23 and he works out at the gym each day. There is a strong family history of ischaemic heart disease and hypertension. The GP wants advice regarding treating his blood pressure.

What is your advice to the GP?

A	Start amlodipine
B	Arrange a 24 h ABPM to decide on the best therapeutic intervention
C	Start ramipril
D	Start bendroflumethiazide
E	Start atenolol

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C	Start ramipril
D	Start bendroflumethiazide
E	Start atenolol

Explanation

B	Arrange a 24 h ABPM to decide on the best therapeutic intervention

In this patient, where there are no obvious risk factors for hypertension, 'white coat syndrome' should be avoided first. NICE guidelines therefore recommend ambulatory blood pressure monitoring.

A	Start amlodipine

Calcium channel blockers are the first-line intervention of choice for patients of Afro-Caribbean ethnic origin and those who are above 55 years of age.

C	Start ramipril

ACE inhibition would only be recommended in this situation once hypertension has actually been confirmed by ambulatory blood pressure monitoring. Urea and electrolytes should of course be checked first before starting therapy.

D	Start bendroflumethiazide

Thiazides are no longer recommended first-line agents for the treatment of hypertension, because of the negative effects on glucose tolerance over the longer term.

E	Start atenolol

Beta blockers are not a first-line intervention for hypertension, and are best avoided in young men because of possible negative effects on erectile function.

7677

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Responses Correct:	0
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Responses Total:	49
Responses - % Correct:	0%

External Links

Hypertension overview
pathways.nice.org.uk/pathways/hypertension

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A general practitioner (GP) calls you up. He is asking for advice regarding a 52-year-old Caucasian man who came to his surgery complaining of chest pain, which was subsequently diagnosed as musculoskeletal in origin because of tenderness in the upper chest wall and a recent history of moving heavy boxes at home. During his initial assessment the patient's blood pressure was 170/100 mmHg and on subsequent visits it has remained around this level. He is an ex-smoker of 4 years. There is a strong family history of ischaemic heart disease and hypertension. He says that there is no evidence of left ventricular hypertrophy on his electrocardiogram (ECG) and his urine dipstick did not show proteinuria. The GP wants advice regarding treating his blood pressure.

What is your advice to the GP?

A	You suggest treatment with a calcium channel inhibitor
B	You suggest a low-salt diet and regular exercise and to recheck his blood pressure in 3 months' time
C	You suggest treatment with an angiotensin-converting enzyme (ACE) inhibitor
D	You suggest reassurance and a 'do-nothing approach'
E	You suggest treatment with an angiotensin II receptor blocker

7678

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A general practitioner (GP) calls you up. He is asking for advice regarding a 52-year-old Caucasian man who came to his surgery complaining of chest pain, which was subsequently diagnosed as musculoskeletal in origin because of tenderness in the upper chest wall and a recent history of moving heavy boxes at home. During his initial assessment the patient's blood pressure was 170/100 mmHg and on subsequent visits it has remained around this level. He is an ex-smoker of 4 years. There is a strong family history of ischaemic heart disease and hypertension. He says that there is no evidence of left ventricular hypertrophy on his electrocardiogram (ECG) and his urine dipstick did not show proteinuria. The GP wants advice regarding treating his blood pressure.

What is your advice to the GP?

A	You suggest treatment with a calcium channel inhibitor
B	You suggest a low-salt diet and regular exercise and to recheck his blood pressure in 3 months' time
C	You suggest treatment with an angiotensin-converting enzyme (ACE) inhibitor
D	You suggest reassurance and a 'do-nothing approach'
E	You suggest treatment with an angiotensin II receptor blocker

Explanation

This man has moderate hypertension, confirmed over several readings. Even though there is no evidence of end-organ damage and without knowing his total cholesterol to high-density lipoprotein (HDL) cholesterol ratio, he falls into the cardiovascular disease (CVD) risk group of 10–20% over the next 10 years on the Framingham charts. This therefore warrants pharmacological intervention (and not just lifestyle modification). The recently updated **NICE guidelines** give separate guidance for adults over and under the age of 55 years. Meta-analysis of all currently available evidence indicates that first-line therapy for those aged less than 55 years should be an ACE inhibitor (or angiotensin-II blocker if ACEI is not tolerated). In patients over 55 years, initial therapy should be a Ca channel blocker or a thiazide-like diuretic if the Ca channel blocker is unsuitable. The general rule is that smoking cessation of less than 5 years should be regarded as current smoking.

7678

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External Links

Hypertension in adults: diagnosis and management
nice.org.uk/guidance/cg127

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A 66-year-old obese patient has been admitted to the coronary care unit of the University Hospital 2 days ago following an anterior myocardial infarction. Aspirin, atenolol, ramipril, atorvastatin and prophylactic low-molecular weight heparin has been started. The patient has been pain free since thrombolysis and the latest electrocardiogram (ECG) shows Q waves across the anterior chest leads.
You are fast bleeped to coronary care and on arrival the sister tells you that the patient has suddenly become extremely breathless but has no chest pain. He is hypotensive and tachycardic – blood pressure is 80/60 mmHg and heart rate 138 beats/min. Looking through his admission notes there was nil of note on examination and his chest X-ray showed only minimal basal pleural effusions.
On examination, the patient is unwell and feels clammy to touch, his jugular venous pressure is elevated, and the apex beat is diffuse but not displaced. The heart sounds are difficult to hear, as the patient is so obese. There is very little to find on respiratory examination other than tachypnoea. The patient has passed 500 ml of urine over the last 10 h.
The present ECG shows Q waves in the anterior chest leads but no ischaemia. There appears to be electrical alternans in the rhythm strip.

What is the immediate management?

A	Give an immediate dose of intravenous furosemide and organise an urgent chest X-ray
B	Start intravenous inotropes and organise an urgent chest X-ray
C	Immediate cardioversion with 200 J synchronised shock
D	Start intravenous inotropes and organise for insertion of intra-aortic balloon pump
E	Start intravenous inotropes, organise insertion of intra-aortic balloon pump and arrange urgent pericardiocentesis

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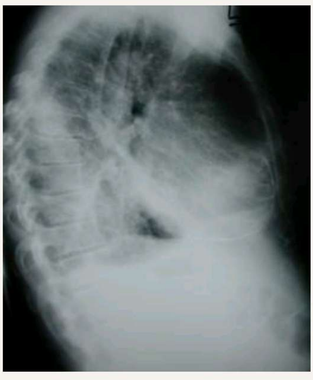
A 65-year-old man known to have rheumatoid arthritis presents with a 2-month history of breathlessness and orthopnoea. He initially presented to his general practitioner (GP), who diagnosed a chest infection and prescribed a course of antibiotic treatment that had helped his breathlessness. But his symptoms soon returned. He comes to see you today in clinic. He gives no history of rheumatic fever, tuberculosis or chest pains. His only medication is co-dydramol for pain relief.

On examination, you find classical arthritic small joint changes with distended neck veins (see below). He is breathless at rest and has normal heart sounds with ascites and ankle oedema. There are bibasal lung crepitations posteriorly.

You arrange admission for this man. His blood tests are normal, an electrocardiogram (ECG) shows sinus rhythm and a lateral chest X-ray is shown below. An echocardiogram reports global bi-ventricular failure with gross bi-atrial dilatation. There is a high-intensity echo signal around the heart.

He is treated for heart failure with intravenous furosemide and fluid restriction, and he has a good response.





What further investigation is most likely to determine the underlying diagnosis?

A	Left heart catheterisation and myocardial biopsy
B	Left and right heart catheterisation with pressure studies
C	Left and right heart catheterisation with venous blood sampling
D	Rheumatoid factor titre and Mantoux testing
E	Surgical pericardial biopsy

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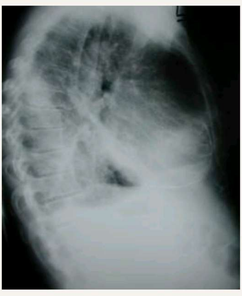
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Explanation

This is a case of constrictive pericarditis. There is calcification of the pericardium on the lateral chest X-ray. The echo is suggestive of the condition. Right and left heart catheterisation will demonstrate equal left and right ventricular and right atrial pressures confirming constrictive pericarditis. Treatment is for heart failure and the underlying cause, hence the need for pericardial biopsy and examination of the tissue.

7680

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You are a gastroenterology senior house officer (SHO). A cardiothoracic SHO has called you asking for some advice. A 70-year-old man has been admitted as an elective patient for aortic valve replacement. A recent echocardiogram reported severe calcific aortic stenosis with a gradient of 110 mmHg across the valve and a valve area of 0.6 cm^2. Routine blood tests have shown this man to have microcytic hypochromic anaemia with an Hb of 8.7 g/dl. Over the past 5 years the patient has undergone several gastric endoscopies and colonoscopies in search of an underlying cause of his anaemia, the last only 1 year ago. However, on each occasion nothing was found. The patient is taking lansoprazole and iron tablets.

Which of the following is the most appropriate course of action with respect to his clinical condition?

A	Give a blood transfusion and replace the aortic valve. No further gastro-endoscopies are needed
B	Give a blood transfusion and arrange for a labelled white cell scan before valvular surgery
C	Give a blood transfusion and cancel the valve surgery, as the patient is too high risk
D	Give a blood transfusion, prescribe additional ranitidine and organise a further endoscopy
E	Refer to a haematologist for bone marrow examination and cancel the valve surgery

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Explanation

This is Heyde's syndrome, a well-known association between microcytic anaemia and calcific aortic stenosis. The treatment is to replace the valve, as the mechanism is thought to be due to destruction of von Willebrand's factor as the platelets traverse the stenosed valve resulting in bleeding per rectum. In view of the severity of aortic stenosis in this case, and the fact that mesenteric angiography may not be easily available, it could potentially be undertaken post surgery. The investigation of choice after valve replacement is mesenteric angiography as the bleeding vessels are poorly visualised on colonoscopy. This would look for the presence of angiodysplasia, which may be associated with aortic stenosis. Resection of the diseased bowel has also been described as a treatment. There is an association with jaundice and aortic stenosis; this is thought to be due to microangiopathic haemolysis. Haemodynamic optimisation prior to surgery with blood transfusion is preferred but this would depend on the surgeon.

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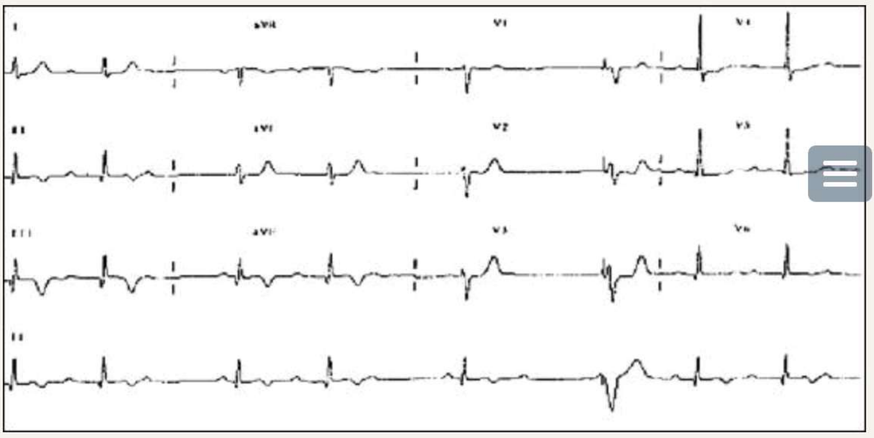
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You are asked to review a man who has been transferred to the ward from coronary care. He is day 3 post-thrombolysis after an inferior myocardial infarction. A routine electrocardiogram (ECG) was requested by the team but was not reviewed as it was done late during the day. The nurse in charge bleeps you and to say the ECG looks abnormal. The nurse reports the patient is eating his dinner at present and his BP is a little low at 95/50 mmHg with a pulse of 48/min. He is on aspirin, metoprolol 25 mg three times daily, atorvastatin 40 mg daily, and ramipril 5 mg twice daily.

The ECG is shown below.



What is your next step in management?

A	The patient needs a temporary pacemaker inserted
B	The patient needs a permanent pacemaker the following day
C	The patient needs a stat dose of intravenous atropine 0.3 mg
D	You reassure the nurse in charge and do nothing
E	You reassure the nurse in charge and reduce the dose of metoprolol

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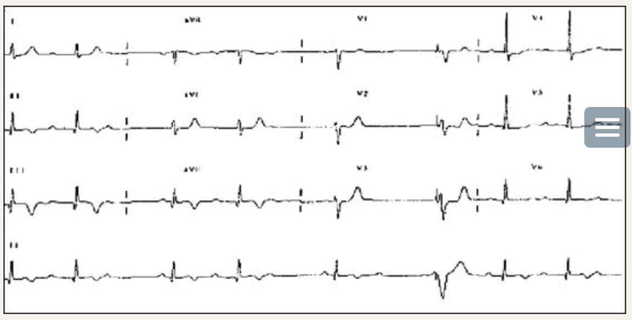
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Explanation

This is 2nd degree atrioventricular (AV) block. It is usually a transient and benign rhythm following an inferior infarct involving the AV nodal artery. It is not an indication for pacing. It may be due to drug toxicity from beta-blockade, digoxin and verapamil. In this scenario, the patient is obviously well and should be kept on 24 h electrocardiogram (ECG) telemetry. If there is development of a higher degree of block then a permanent pacemaker may be needed.

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A 45-year-old smoker, presents to the Accident and Emergency Department following a prolonged episode of chest discomfort lasting 3 hours. His initial electrocardiogram (ECG) shows segment (ST) elevation in the chest wall leads. Thrombolysis therapy with tissue plasminogen activator is given on the advice of the cardiology team. The patient is admitted onto a coronary-care bed and is discharged after an uneventful 5-day period. He re-presents after one month complaining of palpitations and dizziness. The electrocardiogram (ECG) shows a broad complex tachycardia.

Investigations:

Hb	14.2 g/dl
WCC	7.8 x 10^9/l
PLT	310 x 10^9/l
Na^+	140 mmol/l
K^+	3.7 mmol/l
Urea	6.0 mmol/l
Creatinine	95 µmol/l
Ca^{++}	2.21 mmol/l
Mg^{++}	0.88 mmol/l

A central line is inserted and the patient is loaded with amiodarone. His electrocardiogram (ECG) reverts to sinus rhythm with anterior Q waves. An echocardiogram shows antero-septal hypokinesis with moderate left ventricle (LV) impairment.

Which one of the following is the treatment of choice?

A	Amiodarone 200 mg tds
B	Amiodarone 200 mg od
C	Sotalol 80 mg bd
D	Automated implantable cardiac defibrillator
E	Mexiletine

8528

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E	Mexiletine

Explanation

D	Automated implantable cardiac defibrillator

Automated implantable cardiac defibrillator, is correct. The development of ventricular tachycardia/fibrillation (VT/VF) on the first day following an acute myocardial infarction (MI) is thought to be of no prognostic significance if dealt with promptly. However, the late development of VT/VF in the context of a full-thickness myocardial scar, as evidenced by the Q waves on the ECG, carries a very poor prognosis.

Given that there is no evidence of any reversible cause (i.e. electrolyte abnormality) to VF/VT, it is very likely to be scar tissue-related ventricular arrhythmia, especially with the presence of Q waves on ECG indicating a full-thickness infarct. Pharmacological therapy with amiodarone to terminate or prevent recurrence in the acute setting is effective, but in terms of secondary prevention and long-term outcomes, ICD is superior to amiodarone (MADIT-2 trial). Therefore, ICD is indicated in this patient.

A	Amiodarone 200 mg tds

Amiodarone is a class III antiarrhythmic drug which works by slowing the conduction rate and prolonging the refectory period of the SA and AV nodes. Pharmacological therapy with amiodarone to terminate or prevent recurrence in the acute setting is effective, but in terms of secondary prevention and long-term outcomes, ICD is superior to amiodarone. Therefore, ICD is indicated in this patient.

B	Amiodarone 200 mg od

This is the maintenance dose of amiodarone normally used for patients who have been loaded with amiodarone. It is therefore the wrong dose of amiodarone to use in the current setting. However, we should consider that ICD is the appropriate therapy in this case.

C	Sotalol 80 mg bd

Sotalol is a class III antiarrhythmic drug with beta-blocker properties. It has fewer long-term side effects compared with amiodarone and is therefore preferred as a long-term drug. However, in the setting of secondary prevention, ICD is still the gold standard although sotalol could be used as adjunct therapy to reduce risk of shocks.

E	Mexiletine

Mexiletine is a class Ib antiarrhythmic drug. It is used for the prevention of VF/VT and is commonly paired with sotalol or amiodarone.

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External Links

Prophylactic Implantation of a Defibrillator in Patients with Myocardial Infarc...
nejm.org/doi/full/10.1056/NEJMoa013474

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A 68-year-old man with a history of ankylosing spondylitis is referred to the cardiology department following the discovery of a diastolic murmur by the GP. He does not describe any chest pain or breathlessness but he has experienced some palpitations over the last six months. His blood pressure (BP) is 175/95 mmHg with a heart rate of 100 bpm at rest. Clinical examination reveals a collapsing pulse, cardiac apex displaced to the anterior axillary line and a diastolic murmur. The chest is clear on auscultation and there is no peripheral oedema. Electrocardiogram (ECG) shows sinus rhythm with ventricular ectopics and left ventricular hypertrophy. Chest X-ray shows cardiomegaly with clear lung fields. An echocardiogram confirms the presence of aortic regurgitation with a dilated left ventricle and an ejection fraction of 50%. A 24-h ECG shows sinus rhythm with frequent ventricular ectopics that correspond to the patient's experienced palpitations.

Which of the following is the management of choice in this case?

A	Ramipril
B	Bisoprolol
C	Antibiotic prophylaxis advice
D	Annual echocardiographic follow-up
E	Referral to cardiothoracic team for valve replacement

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Explanation

Angiotensin-converting enzyme (ACE) inhibitors but not antibiotic prophylaxis are part of the treatment regime in aortic regurgitation. However this patient, although relatively asymptomatic, needs to be considered for valve replacement given the echo-cardiographic findings of a dilated left ventricle. In the case of regurgitant murmurs, patients tend to be relatively asymptomatic till later on in the course of the disease so regular echocardiographic follow up is required to pick-up individuals with early features of left ventricular failure (LVF) that would benefit from valve replacement.

Under current ACC/AHA guidelines, aortic valve surgery is recommended for patients with chronic severe AR under the following circumstances;

a) Patient is symptomatic
b) Patient is asymptomatic, with a resting EF of < 55%
c) Patient is asymptomatic, with LV dilatation (LV end-systolic dimension >55 mm)
d) Additional circumstances in which aortic valve surgery may be reasonable include the following:

- Patient has moderate AR and is undergoing coronary artery bypass surgery or other surgery involving the ascending aorta
- Patient has severe AR with no symptoms, normal EF, and less severe LV dilation (LV end-systolic dimension >50 mm or LV end-diastolic dimension >70 mm)
- if the patient experiences (1) progressive LV dilation on serial imaging studies; (2) deteriorating exercise tolerance, or (3) abnormal hemodynamic responses to exercise, such as inability to augment blood pressure during a treadmill study

8529

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A 59-year-old heavy goods vehicle driver was admitted to hospital with chest pain. An electrocardiogram (ECG) showed T-wave inversion in leads II, III and aVF. His pain settled within one hour and repeat electrocardiogram (ECG) was normal. A troponin T level after 12 hours was <0.05 g/l (0–0.05). He underwent coronary angiography and had a stent to his right coronary artery. At angiography, the other coronary arteries were mildly stenosed. He was sent home 5 days post-admission.

What advice should have been given to him regarding driving?

A	Do not drive for one month
B	Do not drive the heavy goods vehicle until assessed by the DVLA. Car driving is permitted after one week if pain free
C	Inform the DVLA and do not drive until assessed further
D	He will never be able to drive heavy goods vehicle again but car driving permitted in one month if pain free
E	No restriction on driving

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E	No restriction on driving

Explanation

B	Do not drive the heavy goods vehicle until assessed by the DVLA. Car driving is permitted after one week if pain free

Car driving is permitted after one week if pain free, is correct. This is the correct response according to the DVLA guidelines. Car driving is allowed in 1 week if there is no urgent planned revascularisation and LVEF is >40% before discharge. If not treated by angioplasty, the patient must wait 1 month.

For Class 2 vehicles, driving may be permitted, by the DVLA, after six weeks, providing the exercise test requirements are met. For further information refer to DVLA website given below.

A	Do not drive for one month

This is for patients with a Class 1 driving license who have not had successful coronary intervention.

C	Inform the DVLA and do not drive until assessed further

This is for a Class 2 licence. The patient should still be able to drive Class 1 vehicles.

D	He will never be able to drive heavy goods vehicle again but car driving permitted in one month if pain free

A Class 2 licence is at the discretion of DVLA (until after at least 6 weeks) and car driving should be 1 week after the event.

E	No restriction on driving

Car driving is allowed in a week if there is no urgent planned revascularisation and LVEF is >40% before discharge. For a Class 2 licence, the patient should be in contact with DVLA and not drive until relicensing after at least 6 weeks.

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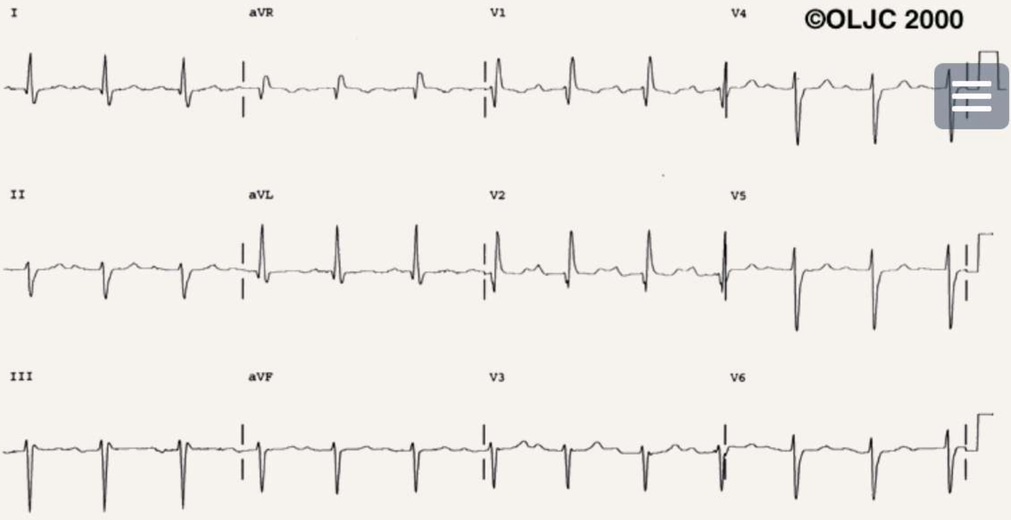
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External Links

Cardiovascular disorders: assessing fitness to drive
gov.uk/guidance/cardiovascular-disorders-assessing-fitness-to-drive

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A 79-year-old man presented with a history of syncope. The electrocardiogram (ECG) is shown below.



What cardiac conduction problem is the most likely underlying cause of his syncope?

A	Right bundle branch block (RBBB)
B	First degree heart block
C	Second degree heart block
D	Bifascicular block
E	Trifascicular block

8585

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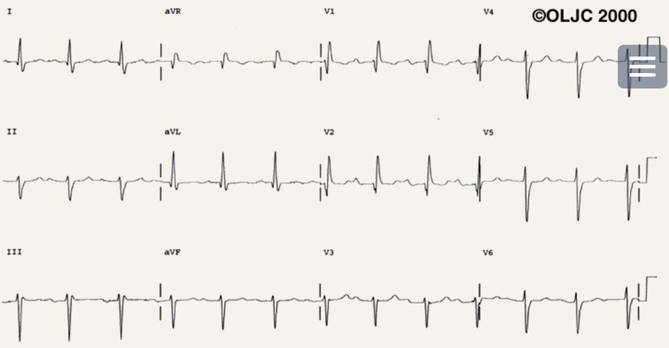
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E	Trifascicular block

Explanation

The electrocardiogram (ECG) shows normal sinus rhythm. The PR interval is grossly prolonged and there is an RSR complex in V_1 compatible with a right bundle branch block (RBBB) and a QRS axis compatible with a left anterior hemi-block (LAHB) (LAHB is diagnosed because the net QRS deflection in lead II is negative). The combination of RBBB, LAHB and long PR interval has been called 'trifasicular' block. Bifascicular and trifascicular block refer to conduction disturbances below the atrioventricular (AV) node in which two or more of the fascicles of the left bundle branch and the right bundle branch are involved. It has been suggested that otherwise unexplained syncope in the presence of bifascicular or trifascicular block is an indication for a permanent pacemaker.

8585

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An 18-year-old man is referred to the hospital clinic complaining of severe headaches. The GP notes that he is hypertensive with a blood pressure of 155/80 mmHg. He has suffered nose bleeds and feels too fatigued to perform any physical exercise. On examination there appears to be radiofemoral delay and a late systolic murmur is heard on auscultation. Chest X-ray shows cardiac enlargement with evidence of rib-notching.

Which of the following diagnoses fits best with this clinical picture?

A	Congenital aortic stenosis
B	Congenital mitral regurgitation
C	Coarctation of the aorta
D	Transposition of the great vessels
E	Atrial septal defect

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C	Coarctation of the aorta
D	Transposition of the great vessels
E	Atrial septal defect

Explanation

C	Coarctation of the aorta

Coarctation of aorta produces a late systolic murmur and radio-femoral delay. Rib-notching present on chest X-ray is due to pressure erosion from enlarged collateral vessels.

This is a narrowing of the aorta, usually found just distal to the origin of the left subclavian artery. It represents 5–10% of all congenital cardiac lesions and patients repaired before the age of 14 years have a 20-year survival of 91%. Survival rates then steadily fall, the later repair is attempted. Associated conditions include Turner syndrome. Older patients may present with hypertension, headaches, nose bleeds, cold peripheries or intermittent claudication. A continuous or late systolic murmur is heard on auscultation.

A	Congenital aortic stenosis

Congenital aortic stenosis accounts for 3-6% of congenital heart disease. Clinical examination findings include ejection-systolic murmur and a narrow pulse pressure. It does not cause a radio-femoral delay and therefore is not the answer in this case.

B	Congenital mitral regurgitation

This produces a pan-systolic murmur on auscultation. It does not cause radio-femoral delay.

D	Transposition of the great vessels

Transposition of the great vessels is one of the commonest cyanotic congenital heart diseases. Patients who are not treated have a high mortality rate – 30% in the first week, 50% in the first month and 90% in the first year. Treatment is surgical, commonly with an arterial switch procedure.

E	Atrial septal defect

ASD is commonly associated with Down syndrome and Ebstein anomaly. Clinical examination findings include fixed splitting of the second heart sound, which does not change with respiration.

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A 48-year-old van driver presents with central chest pain. Past history of note includes type 1 diabetes, hypertension and smoking with a 30 pack-year history. The pain is pleuritic, retrosternal and relieved on sitting forward. On examination, his blood pressure is 148/90 mmHg and pulse is 85/min and regular. There is generalised saddle-shaped ST elevation on ECG.

Which of the following is the most appropriate treatment in this case?

A	Ibuprofen
B	Indometacin
C	Streptokinase
D	Tissue plasminogen activator
E	Paracetamol

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Which of the following is the most appropriate treatment in this case?

A	Ibuprofen
B	Indometacin
C	Streptokinase
D	Tissue plasminogen activator
E	Paracetamol

Explanation

A	Ibuprofen

Although the patient has multiple risk factors for coronary artery disease, the description of chest pain and ECG appearance is highly suggestive of acute pericarditis. The most common viral cause is Coxsackie B virus; other causes include adenovirus, echovirus and influenza viruses. Acute viral pericarditis may occasionally be associated with accumulation of a pericardial effusion.

ESC guidelines have defined the diagnosis of acute pericarditis as 2 out of 4 of the following: (1) pericarditic chest pain; (2) pericardial rub; (3) new widespread ST-elevation or PR depression; and (4) pericardial effusion (new or worsening).

Ibuprofen is a NSAID which is considered first-line therapy for pericarditis. Aspirin or colchicine is the other alternative. Treatment duration should be guided by symptoms and blood tests (CRP), but normally it is for 1-2 weeks' duration. If patients are unable to take NSAIDs, colchicine is the alternative. Corticosteroids should only be used as second line due to the risk of drug dependence. Patients should be told to reduce physical activity for a minimum of 3 months from initial onset.

B	Indometacin

Indometacin is also a NSAID. The recommended NSAID according to ESC guidelines is either ibuprofen or aspirin. However, ESC do recommend the use of indometacin in the context of recurrent pericarditis.

C	Streptokinase

In the presence of generalised saddle-shaped ST elevation, this is most likely to be pericarditis. Therefore, the use of thrombolysis with streptokinase is not warranted.

D	Tissue plasminogen activator

In the presence of generalised saddle-shaped ST elevation, this is most likely to be pericarditis. Therefore, the use of thrombolysis with streptokinase is not warranted.

E	Paracetamol

Paracetamol is useful as a generic painkiller, but in the context of acute pericarditis the use of NSAIDs or aspirin should be considered as first line.

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Responses Total:	60
Responses - % Correct:	0%

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A 78-year-old man is referred is referred to the cardiology clinic complaining of increased tightness in his chest. He gets chest tightness and shortness of breath on walking up a hill, and going out in very cold weather. His exercise tolerance has been reduced over the past few months but he is still easily able to walk his dog. He has a past medical history of angina although he has never had any diagnostic tests. Having said that, he has been using his glyceryl trinitrate (GTN) spray more frequently and, as such, his general practitioner had to add a long-acting nitrate to his regime a few months earlier. Other medication includes ramipril, aspirin and atorvastatin.

On examination, he is comfortable at rest with a blood pressure of 135/80 mmHg and pulse of 72 bpm and regular. He has no peripheral oedema and his jugular venous pulse is not raised. First and second heart sounds are heard and there are no murmurs. His chest is clinically clear.

Investigations:

ECG	sinus rhythm with Q waves in the inferior leads
chest X-ray	normal
full blood count (FBC)	U/Es and lipid profile are within normal range

What is the next step in the treatment of this gentleman?

A	Further medical management for angina
B	Angiography
C	Technetium scan
D	Exercise stress testing
E	Positron emission tomography

9483

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What is the next step in the treatment of this gentleman?

A	Further medical management for angina
B	Angiography
C	Technetium scan
D	Exercise stress testing
E	Positron emission tomography

Explanation

A Further medical management for angina

From the history, this patient has stable angina with good exercise tolerance. He is already on the appropriate medications, i.e. aspirin, ACE-I and statin as per NICE guidelines (see first weblink below). Medical management with anti-anginals would be the first step. Beta-blocker or calcium channel blockers are recommended by NICE. Long-acting nitrates could be used if either of the drugs is not tolerated or insufficient. If the patient continues to have chest pain despite being on optimal medical therapy, then he should be considered for revascularisation with PCI or CABG.

B Angiography

Given that the patient has stable angina, the first line would be to use medical therapy. If we are unable to control his symptoms with medical therapy, then angiography should be the next investigation to plan revascularisation strategy with either PCI or CABG.

C Technetium scan

This patient clearly has stable angina and therefore does not need further investigations to confirm that. Should the patient warrant further investigations to diagnose significant coronary artery disease, the use of CT coronary angiogram is recommended as first line followed on by non-invasive functional testing (stress echo, MPS or stress CMR). See second weblink below.

D Exercise stress testing

As above, ETT has grown out of favour in diagnosing/ruling out coronary artery disease due to its poor sensitivity. However, it can still be used to guide prognosis and treatment of patients with established ischaemic heart disease.

E Positron emission tomography

Cardiac PET scanners are not widely available in the UK; these are currently used mostly in the research setting and are useful in identifying coronary artery disease and how it affects myocardial blood flow. Therefore, PET plays a role in a specialist setting to determine whether interventions would be beneficial for some groups of patients.

9483

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Responses Incorrect:	61
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External Links

Stable angina: management
nice.org.uk/guidance/cg126/chapter/1-Guidance#general-principles-for-treating-peo...

Chest pain of recent onset: assessment and diagnosis
nice.org.uk/guidance/cg95/chapter/recommendations

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A 71-year-old man is admitted to the Emergency Department with shortness of breath. He had taken his dog for a walk 2 h ago when he started having palpitations, felt very dizzy and short of breath. He sat down and dialled 999 for an ambulance. He has a past medical history of two myocardial infarctions sustained over the previous couple of years, and heart failure. He is on the following medications: bisoprolol 2.5 mg od, spironolactone 25 mg od, ramipril 2.5 mg od and aspirin 75 mg od.

On examination, he is breathless with a blood pressure of 86/50 mmHg, pulse of >100/min and respiratory rate of 28/min. His jugular venous pulse is raised and he has pedal oedema. First, second and third heart sounds are heard producing a gallop rhythm. Respiratory examination reveals bibasal crackles.

His ECG reveals a broad complex tachycardia and you decide that he needs a direct current (DC) shock. You DC cardiovert him and he reverts back to sinus rhythm. His blood pressure rises to 110/60 mmHg and his pulse to 82/min and regular.

What measure is most likely to prolong this gentleman's life?

A	Start him on furosemide
B	Start him on amiodarone
C	Start him on flecainide
D	Start him on procainamide
E	Insert an implanted cardioverter defibrillator

9484

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E	Insert an implanted cardioverter defibrillator

Explanation

E	Insert an implanted cardioverter defibrillator

The patient has had scar tissue-related ventricular arrhythmia. This fits the criteria for the insertion of a secondary prevention ICD. As we were not informed of his LV function and resting ECG morphology, we do not know whether he would fit the criteria for biventricular pacing (CRT). Therefore, the use of an ICD is the most appropriate in this instance. ICDs have been shown to prolong life in patients with left ventricular dysfunction and sustained ventricular arrhythmias. Patients with an ejection fraction higher than 35% did no better with an ICD than with drug treatment.

A	Start him on furosemide

Furosemide is useful to treat the symptoms of heart failure via diuresis. However, it does not confer any prognostic benefit for patients.

B	Start him on amiodarone

Amiodarone is a class III antiarrhythmic drug which works by slowing the conduction rate and prolonging the refectory period of the SA and AV nodes. Pharmacological therapy with amiodarone to terminate or prevent recurrence in the acute setting is effective, but in terms of secondary prevention and long-term outcomes, ICD is superior to amiodarone. Therefore, ICD is indicated in this patient.

C	Start him on flecainide

Flecainide is contraindicated in patients with coronary artery disease. The Cardiac Arrhythmia Suppression Trial (CAST) revealed that when encainide and flecainide were used to prevent arrhythmias in patients post-myocardial infarction, these drugs were detrimental to survival.

D	Start him on procainamide

Procainamide is mainly used for SVT and can cause significant hypotension. Its use in pulseless VT/VF is supported by a retrospective comparison study of 20 patients. It is therefore less commonly used compared to amiodarone.

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A 57-year-old gentleman is referred to the cardiology clinic by his general practitioner for an abnormality on his electrocardiogram (ECG). He had gone to see his GP for a general medical check up. His past medical history is unremarkable and he is not on any medication. His physical examination is essentially normal.

The following results are obtained:

ECG	sinus rhythm with second-degree heart block (Mobitz type I)
chest X-ray (CXR)	normal
full blood count (FBC)	U/E, liver function tests (LFTs) and lipid profile are within normal range.

How would you manage this gentleman?

A	Refer him for permanent pacemaker insertion
B	Start him on amiodarone
C	Start him on flecainide
D	Temporary pacemaker insertion
E	Discharge him from the clinic

9486

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Normal Values

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A	Refer him for permanent pacemaker insertion
B	Start him on amiodarone
C	Start him on flecainide
D	Temporary pacemaker insertion
E	Discharge him from the clinic

Explanation

This asymptomatic man with second-degree (mobitz type I) heart block should be discharged from the clinic. Second-degree atrioventricular block Mobitz type I (Wenckebach phenomenon) is the progressive PR interval prolongation until a P wave fails to conduct. The PR interval before the blocked P wave is much longer than the PR interval after the blocked P wave. The risk of progression to complete heart block with Mobitz type I in an asymptomatic man is very low, unlike in Mobitz type II. The risk factors for cardiovascular disease are very low in this man and he can be safely discharged from the clinic.

9486

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Responses Correct:	0
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A 67-year-old gentleman is referred to the cardiology clinic by his General Practitioner for an abnormal heart sound. He had gone to see his GP for a general medical check up. His past medical history is unremarkable and he is not on any medication.

On examination, he is comfortable at rest with a blood pressure of 145/65 mmHg, pulse of 66/min and regular. He has no pedal oedema and his jugular venous pressure is not raised. He has an early diastolic murmur best heard at the left sternal edge in expiration with the patient leaning forward. His chest is clinically clear.

The following results are obtained:

chest X-ray	normal
electrocardiogram (ECG)	sinus rhythm
Echocardiogram	LV enlargement seen. There is a mild to moderate aortic regurgitation
full blood count (FBC)	U&E, liver function tests (LFTs) and lipid profile are within normal range

How are you going to manage this man?

A	Start him on a ß-blocker
B	Start him on an angiotensin-converting enzyme (ACE) inhibitor
C	Start him on digoxin
D	Discharge him from the clinic
E	Start him on aspirin

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C	Start him on digoxin
D	Discharge him from the clinic
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Explanation

This asymptomatic man with aortic regurgitation should be started on an ACE inhibitor. The Studies Of Left Ventricular Dysfunction (SOLVD) trial did show that enalapril did improve the prognosis in asymptomatic left ventricular dysfunction. ACEI slowed the development of left ventricular dysfunction. This same trial also showed symptomatic improvement and prognosis in patients with symptomatic heart failure.

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A 69-year-old woman is admitted to the Emergency Department with palpitations. The palpitations started while she was doing some house chores 2 h ago. There is no associated shortness of breath but she is just uncomfortable being aware of her heart beating fast. She has had palpitations in the past but these have been brief and lasted for only a very short time, a previous holter has captured periods of SVT with aberrant conduction. She has a past medical history of hypertension and she takes 10 mg of amlodipine for it.

On examination, she is anxious with a blood pressure of 130/70 mmHg, pulse rate of 143/min and a respiratory rate of 22/min. Her oxygen saturation is 99% on air and her chest is clinically clear. Her jugular venous pulse is not raised and there is no peripheral oedema. The first and second heart sounds are heard but you are not sure whether there is a third heart sound.

The following results are obtained:

Electrocardiogram (ECG)	reveals a broad complex tachycardia, QRS complex > 140 ms, but you are not sure whether this is a supraventricular or a ventricular tachycardia
Chest X-ray	appears normal

How would you manage this patient?

A	Esmolol IV
B	Consider adenosine to differentiate between VT and SVT
C	Just observe the patient
D	DC cardioversion
E	Discharge the patient

9488

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Chest X-ray	appears normal

How would you manage this patient?

A	Esmolol IV
B	Consider adenosine to differentiate between VT and SVT
C	Just observe the patient
D	DC cardioversion
E	Discharge the patient

Explanation

This patient is haemodynamically stable but has a broad complex tachycardia. It is not always easy to tell whether the broad complex tachycardia is of ventricular or supraventricular origin but the safest course of action is to consider a drug like adenosine which will cause short lived AV block in SVT but not in VT. It is the presence of aberrant conduction which can lead to diagnostic confusion. The haemodynamic status has little bearing in distinguishing whether it has a ventricular or supraventricular origin. Chemical cardioversion would be appropriate in this patient who is haemodynamically stable.

9488

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A 65-year-old lady comes to the cardiology clinic for follow up of her angina. She attended clinic 6 weeks ago and an exercise test was requested. The following is the summary of her exercise test: 'she started having chest pains in the second stage of the Bruce protocol. There was ST depression of 2.5 mm in V1 to V4. This is a positive exercise test'.

What is the next step in the management of this lady?

A	By-pass surgery
B	Angiogram ± angioplasty
C	Technetium scan
D	Thallium stress test
E	24-h ECG

9490

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A	By-pass surgery
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C	Technetium scan
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E	24-h ECG

Explanation

The diagnostic value of electrocardiogram (ECG) exercise testing was recognised as early as 1928 by Feil and Siegel. The test is used to estimate prognosis and to determine functional capacity, likelihood and extent of coronary disease and effects of therapy. This lady had early onset of angina and ischaemic ECG changes that are associated with an adverse prognosis and more severe coronary artery disease. This lady would need an angiogram to determine the extent of her disease. The extent of her coronary disease would determine which therapeutic intervention would be most suitable.

9490

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Responses Correct:	0
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Responses Total:	66
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A 48-year-old man is referred to the cardiology clinic for palpitations. The palpitations have been there for 6 months and he had been trying to ignore them but his wife encouraged him to seek medical attention. He gets palpitations every other day and they last for up to a minute. The palpitations are not associated with shortness of breath, chest pain, dizziness and there is no obvious precipitating factor. His past medical history is unremarkable and he is not on any medication.

On examination, he is comfortable with a blood pressure of 132/72 mmHg and pulse rate of 66/min. Cardiovascular, respiration, abdominal and central nervous systems are all normal.

The following results are obtained:

ECG	sinus rhythm
Chest X-ray	normal
FBC, U/Es, LFTs, TFTs, lipid profile and Echo are within normal range	
24-hour tape	sinus rhythm throughout except one episode of premature ventricular ectopics (PVEs). This episode comprised 5 PVEs within a minute

How would you manage this gentleman?

A	Arrange an angiogram for him
B	Start him on a beta blocker
C	Start him on a calcium-channel blocker
D	Start him on amiodarone
E	Reassure him

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E	Reassure him

Explanation

With normal investigations it is unlikely that there is anything sinister going on in this man. For PVE to be significant they have to meet the following criteria:

- Occurring frequently (6 or more beats/min)
- PVE in bigeminal rhythm
- PVE in short runs of ventricular tachycardia
- PVE exhibiting R-on-T phenomenon
- PVE associated with serious organic heart disease and left ventricular decompensation.

The symptoms in this young man are not disabling and he will only need reassurance.

9495

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Responses Incorrect:	67
Responses Total:	67
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A 68-year-old year lady comes to the cardiology clinic for follow up. She had a posterior myocardial infarction 6 weeks ago, was thrombolysed and recovered uneventfully. She is on 80 mg atorvastatin, 75 mg aspirin and 2.5 mg bisoprolol.

She read an article on the Internet that vitamin E was good for people who have had a previous heart attack and would like your opinion on it.

How would you advise this lady?

A	She should start taking 400 U/day of vitamin E
B	She should start taking 400 U of vitamin E weekly
C	There is no evidence that it is beneficial
D	It reduces the incidence of strokes
E	It is only good for diabetics who have had heart attacks

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Normal Values

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E	It is only good for diabetics who have had heart attacks

Explanation

The Heart Outcomes Prevention Evaluation (HOPE) study was a large randomised trial of ramipril and vitamin E in patients at high risk of cardiovascular events. This study showed no significant differences in the numbers of myocardial infarction, stroke or cardiovascular death between the vitamin E group and the placebo group. The HOPE-TOO was an extension of the same study and still showed no significant differences between the vitamin E group and the placebo group.

9496

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Difficulty: Difficult

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Session Progress

Responses Correct:	0
Responses Incorrect:	68
Responses Total:	68
Responses - % Correct:	0%

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A 19-year-old football player is referred to the emergency department for a suspected acute coronary syndrome. He was one of the several players who were being recruited into a study. He had just finished training at the sports centre and was undergoing a series of tests including an ECG. When the ECG was taken, it showed an ST segment elevation of 2 mm in the anterior chest leads and he was quickly referred to the emergency department.

On arrival at the emergency department, he was comfortable at rest but a bit apprehensive. He had no chest pain during or after exercise, shortness of breath or dizziness. His past medical history was unremarkable and he was not on any medication. His physical examination was entirely normal.

The following results were obtained:

Chest X-ray	normal
ECG	sinus rhythm with no acute changes (taken in the emergency department). The ECG taken at the sports centre an hour earlier showed ST elevation of 2 mm in V1–V6

What is the most likely diagnosis?

A	Wolff–Parkinson–White syndrome
B	Early repolarization variant
C	Acute myocardial infarction
D	Pericarditis
E	Pulmonary embolism

9498

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Calculator

Normal Values

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What is the most likely diagnosis?

A	Wolff–Parkinson–White syndrome
B	Early repolarization variant
C	Acute myocardial infarction
D	Pericarditis
E	Pulmonary embolism

Explanation

There exists a benign but often alarming electrocardiographic entity that presents with ST segment elevation. It is known as the early repolarization variant and expresses as an early uptake of the ST segment before the descending limb of the R wave has reached the baseline. Features of early repolarization variant are:

- Classically the ST segment elevation during early exercise returns to normal as heart rate increases further
- It is common in black males
- Clinical evaluation is entirely normal
- ST elevation is usually seen in the precordial leads

9498

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Difficulty: Difficult

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Session Progress

Responses Correct:	0
Responses Incorrect:	69
Responses Total:	69
Responses - % Correct:	0%

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A 45-year-old woman of no fixed abode is brought to the emergency department by police officers. She was found lying on a bench at the railway station very weak. She is a poor historian and has only complained of several loose motions and vomiting. She denied any other symptoms.

On examination, she is dehydrated with a blood pressure of 100/55 mmHg, a pulse of 104/min and regular. She has slight abdominal tenderness on deep palpation but no organomegaly. Cardiovascular, respiratory and nervous systems are essentially normal.

The following results are obtained:

CXR	normal
ECG	sinus rhythm with tachycardia and prominent U waves
Haemoglobin	15.8 g/dl
Mean cell volume	88.6 fL
Platelets	210 × 10^9 /l
White cell count	11 × 10^9 /l
Sodium	136 mmol/l
Potassium	2.6 mmol/l
Urea	9.7 mmol/l
Creatinine	131 mol/l
Magnesium	0.71 mmol/l

What is the most important immediate management of this patient?

A	Start her on oral antibiotics
B	Start her on intravenous antibiotics
C	Rehydration with potassium supplementation
D	Dialysis
E	Drug screen

9499

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Calculator

Normal Values

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What is the most important immediate management of this patient?

A	Start her on oral antibiotics
B	Start her on intravenous antibiotics
C	Rehydration with potassium supplementation
D	Dialysis
E	Drug screen

Explanation

This patient is clearly dehydrated and hypokalaemic. The significance of the hypokalaemia is reflected in the prominence of the U waves on the ECG. The U wave is produced by slow and late repolarization of the intraventricular Purkinje system and follows the T wave. The causes of prominent U waves are:

- Hypokalaemia
- Cardiovascular drugs, e.g. digitalis, quinidine, amiodarone
- Psychotropic drugs, e.g. phenothiazines, tricyclic antidepressants.

9499

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Difficulty: Easy

Peer Responses %

Session Progress

Responses Correct:	0
Responses Incorrect:	70
Responses Total:	70
Responses - % Correct:	0%

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A 73-year-old lady comes to the cardiology clinic for follow up. Her general practitioner referred her to the cardiology clinic when she was found to have isolated systolic hypertension 3 months ago. Her systolic blood pressure (BP) ranged between 155 and 188 mmHg and her diastolic BP ranged between 70 and 82 mmHg. She was not started on medication and was encouraged to reduce her salt intake, lose some weight and start exercising.

She now comes to your clinic and her BP is 180/75 mmHg. She had been taking a series of BPs at home with systolic ranging from 150 to 180 mmHg and diastolic ranging from 65 to 75 mmHg.

How would you manage this lady?

A	Continue with non-pharmacological approach
B	Reassure her not to worry
C	No evidence that treatment affects outcome
D	Discharge her from the clinic
E	Start antihypertensive treatment

9500

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Calculator

Normal Values

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How would you manage this lady?

A	Continue with non-pharmacological approach
B	Reassure her not to worry
C	No evidence that treatment affects outcome
D	Discharge her from the clinic
E	Start antihypertensive treatment

Explanation

This elderly lady with isolated systolic hypertension needs to be started on antihypertensive treatment. Evidence comes from the Systolic Hypertension in the Elderly Program (SHEP) study, which evaluated whether antihypertensive drug treatment reduces the risk of total stroke in men and women with isolated systolic hypertension, aged ⩾60 years. The 5-year incidence of total stroke was 5.2% in the active treatment group and 8.2% in the placebo group (P = 0.0003). Major cardiovascular events were also reduced.

9500

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Session Progress

Responses Correct:	0
Responses Incorrect:	71
Responses Total:	71
Responses - % Correct:	0%

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A 47-year-old man is referred to the emergency department by his general practitioner because of a very high blood pressure. He is complaining of a severe headache and has vomited. He was being investigated for hypertension and is not on any medication.

On examination, he has mild dyspnoea with a blood pressure (BP) of 200/105 mmHg and a pulse of 90/min. Jugular venous pressure is not raised. First and second heart sounds are heard and there are no murmurs. There are bibasal crackles consistent with hypertensive left ventricular failure.

The other systems are entirely normal. The following results are obtained:

Chest X-ray	normal
ECG	sinus rhythm
Fundoscopy	Grade 2 hypertensive retinopathy
FBC, U/Es, LFTs, urinalysis and lipid profile	are within normal range

What is the most important immediate management of this patient?

A	Intravenous nitroprusside titrated for gradual reduction in BP
B	Sublingual nifedipine
C	Oral atenolol
D	Oral captopril
E	Just observe the patient

9501

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Calculator

Normal Values

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A 47-year-old man is referred to the emergency department by his general practitioner because of a very high blood pressure. He is complaining of a severe headache and has vomited. He was being investigated for hypertension and is not on any medication.

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B	Sublingual nifedipine
C	Oral atenolol
D	Oral captopril
E	Just observe the patient

Explanation

This man has markedly elevated blood pressure and evidence of decompensation with evidence of LVF. IV sodium nitroprusside titrated for gradual BP reduction would be a good choice. IV labetolol may be a reasonable alrernative. Sublingual nifedipine and oral captopril would cause rapid BP reduction followed by rebound in blood pressure and may be associated with increased mortality although the evidence to support this notion is a little weak. More recently good evidence has emerged for the use of IV nicardipine in the management of malignant hypertension.

Peacock WF, Varon J, Baumann BM, et al. CLUE: a randomised comparative effectiveness trial of IV nicardipine versus labetalol use in the emergency department. Crit Care, 2011;15(3):R157

9501

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Responses Correct:	0
Responses Incorrect:	72
Responses Total:	72
Responses - % Correct:	0%

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A 38-year-old man is referred to the cardiology clinic by a company doctor for an abnormal heart murmur detected during a routine medical check up. He had to undergo a medical check up before starting a new job with the company. He is asymptomatic. His past medical history is unremarkable and he is not on any medication.

On examination, the blood pressure is 135/65 mmHg, pulse 74/min and regular. His apex beat is in the 6th intercostals space in the anterior axillary line and his jugular venous pulse is not raised. First and second heart sounds are heard and there is a pan-systolic murmur of grade 3/6 radiating to the axilla.

His chest is clinically clear. The following results are obtained:

ECG	sinus rhythm with evidence of left ventricular hypertrophy
Chest X-ray	slight cardiomegaly
Echo	diastolic left ventricular dimension of 6.6 cm with an ejection fraction of 35%. The left atrial dimension is 5.5 cm and there is moderate mitral regurgitation
FBC, U/Es, LFTs, TFTs, urinalysis and lipid profile are within normal range	

How would you manage this young man?

A	Start him on a ACE inhibitor
B	Review him in 6 months
C	Start him on a diuretic
D	Start digoxin
E	Start a calcium channel blocker

9502

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Calculator

Normal Values

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B	Review him in 6 months
C	Start him on a diuretic
D	Start digoxin
E	Start a calcium channel blocker

Explanation

There is evidence that ACE inhibitors reduce adverse events in patients with left ventricular dysfunction with no overt heart failure. The Studies of Left Ventricular Dysfunction (SOLVED) study investigated left ventricular dysfunction with and without overt congestive heart failure. In the prevention arm, enalapril reduced the combined incidence of death and development of overt congestive heart failure that was statistically significant.

http://pathways.nice.org.uk/pathways/chronic-heart-failure/treatment-for-heart-failure-due-to-left-ventricular-systolic-dysfunction

9502

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Difficulty: Average

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Responses Correct:	0
Responses Incorrect:	73
Responses Total:	73
Responses - % Correct:	0%

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A 32-year-old intravenous drug abuser presents with history of fever of 2 weeks' duration. The fever is intermittent and partially responds to paracetamol. He also is experiencing generalised fatigue, anorexia, and has a weight loss of 1.5 kg in last 2 weeks. He has no past medical history of note and takes no regular medications. Physical examination reveals temperature 38.2°C, blood pressure 132/88 mmHg, heart rate 108/min and respiratory rate 22/min. There is no jugular venous distension, a soft ejection systolic murmur is heard at the aortic area and the chest is clear to auscultation. Blood cultures are taken and patient is started on intravenous (iv) ceftriaxone. The blood cultures are reported positive for Candida albicans. An echocardiogram is requested that shows bicuspid aortic valve with vegetations. Ceftriaxone is stopped and the patient is started on amphotericin B.

What is the next most appropriate management of this patient?

A	Continue iv amphotericin B for 6 weeks
B	Continue amphotericin B for 2 weeks then iv fluconazole for 4 weeks
C	iv Amphotericin B plus fluconazole for 6 weeks
D	Valve replacement followed by amphotericin B for 6 weeks
E	Amphotericin B for 6 weeks followed by surgical resection

9537

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Calculator

Normal Values

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B	Continue amphotericin B for 2 weeks then iv fluconazole for 4 weeks
C	iv Amphotericin B plus fluconazole for 6 weeks
D	Valve replacement followed by amphotericin B for 6 weeks
E	Amphotericin B for 6 weeks followed by surgical resection

Explanation

Valve replacement followed by amphotericin B for 6 weeks
Intravenous drug abuse, immunodeficiency states and indwelling catheters are risk factors for candida endocarditis. The aortic valve is the most common valve to be involved. Optimum management involves intravenous (iv) amphotericin and early surgery. Amphotericin should be continued for at least 6 weeks. Despite this, recurrences can occur. Other conditions in which surgery should be done for optimum management in the setting of infective endocarditis include

• congestive heart failure
• organisms that are difficult to eradicate by medical therapy as such fungi, brucella, coxiella, pseudomonas aeruginosa, vancomycin-resistant enterococci
• recurrent embolisation
• persistent bacteraemia despite appropriate antibiotic therapy
• extension of infection to a extravalvular site
• early prosthetic valve endocarditis (within 2 months)
• dehiscence or obstruction of a prosthetic valve.

9537

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Responses Correct:	0
Responses Incorrect:	74
Responses Total:	74
Responses - % Correct:	0%

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A 58-year-old man had a 2-h history of chest pain while exercising at the gym. An ambulance was called to the scene and upon arrival of the paramedics the patient was witnessed to clutch his chest and collapse. A defibrillator trace showed ventricular flutter (VF). The paramedics gave a 360 J direct current (DC) shock in the ambulance, followed by 3 min of Cardio pulmonary resuscitation (CPR) en route to the hospital. On arrival he remains in VF.

What is your immediate management step?

A	Adrenaline iv
B	Calcium chloride iv
C	Sodium bicarbonate iv
D	Give CPR for 1 min and reassess the rhythm
E	Repeat DC shock at 360 J

9838

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Calculator

Normal Values

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A 58-year-old man had a 2-h history of chest pain while exercising at the gym. An ambulance was called to the scene and upon arrival of the paramedics the patient was witnessed to clutch his chest and collapse. A defibrillator trace showed ventricular flutter (VF). The paramedics gave a 360 J direct current (DC) shock in the ambulance, followed by 3 min of Cardio pulmonary resuscitation (CPR) en route to the hospital. On arrival he remains in VF.

What is your immediate management step?

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C	Sodium bicarbonate iv
D	Give CPR for 1 min and reassess the rhythm
E	Repeat DC shock at 360 J

Explanation

The 2005 Resuscitation (UK) guidelines recommend alterations in the traditional resuscitation protocol based on experimental studies in cardiac arrest. First DC shocks in witnessed ventricular tachycardia (VT)/VF arrests are highly successful at restoring rhythm, but a palpable pulse may not be felt for some time. During this time CPR is now considered safe and will aid myocardial perfusion whether normal rhythm is restored or not. Suspension of CPR while rhythm and pulse is checked after a shock will increase myocardial hypoxia and make the cardiac muscle more refractory to further DC shocks. Escalation of shocks has also been found no more effective than a single biphasic (150–360 J) or monophasic (360 J) shock and therefore single shock protocols have been adopted by the resuscitation council.

In a witnessed VF arrest the guidelines now suggest that a single DC shock is given (either biphasic or monophasic) followed by immediate chest compressions (without feeling for a pulse or reassessing rhythm). After 2 min of CPR the rhythm should be reassessed and if still VF a further DC shock should be given. After a further 2 min of CPR of VF persist iv adrenaline should be given followed by a further DC shock.

Calcium chloride and bicarbonate are recommended only for the treatment of hyperkalaemia in this setting and should be considered only once a biochemical diagnosis has been made.

9838

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Session Progress

Responses Correct:	0
Responses Incorrect:	75
Responses Total:	75
Responses - % Correct:	0%

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A 21-year-old medical student is admitted by ambulance to the Emergency department. He was found by a passer-by in a state of undress and was unresponsive. On admission to the Emergency Department he has a GCS of 4, with unresponsive dilated pupils. Core temperature is measured at 28ºC, and re-warming is commenced. Some 10 minutes after admission to the department he develops ventricular fibrillation.

Which of the following fits best with the treatment of pulseless ventricular arrhythmia in this case?

A	Amiodarone is likely to be effective
B	Lignocaine is likely to be effective
C	Repeated defibrillation is likely to be required
D	Prolonged cardiopulmonary resuscitation is likely to be required
E	Defibrillation at voltages higher than 360 V is recommended

18525

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Normal Values

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D	Prolonged cardiopulmonary resuscitation is likely to be required
E	Defibrillation at voltages higher than 360 V is recommended

Explanation

D	Prolonged cardiopulmonary resuscitation is likely to be required

At core temperatures of less than 30°C, treatment of ventricular arrhythmia with medical therapy is largely ineffective, and electrical cardioversion is less effective than in normotensive patients. For this reason, a prolonged period of CPR may be required until core temperature is above 30°C. Defibrillation should be limited to three shocks, and drugs should be withheld at temperatures below 30°C. Between 30–35 °C, the intervals between drug doses should be doubled when compared with normothermia intervals. Where available, for a long period of cardiac arrest, cardiopulmonary bypass may be effective, although practically this is possible in only a handful of centres within the UK.

A	Amiodarone is likely to be effective

In hypothermic arrest, drugs are less effective - metabolism is slowed and there is the possibility of accumulation to toxic levels - and prolonged resuscitation with re-warming is the management of choice.

B	Lignocaine is likely to be effective

In hypothermic arrest, drugs are less effective - metabolism is slowed and there is the possibility of accumulation to toxic levels - and prolonged resuscitation with re-warming is the management of choice.

C	Repeated defibrillation is likely to be required

Defibrillation is less effective in hypothermia. For ventricular fibrillation/ventricular tachycardia (VF/VT), defibrillation can be tried up to three times but should then not be tried until the temperature reaches 30°C.

E	Defibrillation at voltages higher than 360 V is recommended

Defibrillation is less effective in cases of hypothermia - re-warming and prolonged CPR is the management of choice. Defibrillation can be tried if VF/VT is present, but should be performed as per standard life support guidelines and not at an increased voltage.

18525

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Difficulty: Easy

Peer Responses %

Session Progress

Responses Correct:	0
Responses Incorrect:	76
Responses Total:	76
Responses - % Correct:	0%

External Links

RCEM Learning. Cardiac arrest in Special Circumstances: Hypothermic Cardia...
rcemlearning.co.uk/references/cardiac-arrest-in-special-circumstances-hypothermic-...

Resuscitation Council UK. Prehospital Resuscitation
resus.org.uk/resuscitation-guidelines/prehospital-resuscitation/

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You are called to a cardiac arrest on the cardiac unit. A 58-year-old man was admitted 2 days previously with an anterior myocardial infarction; the nurses tell you that he was making a reasonable recovery until the onset of chest pain 30 minutes ago. As the ward doctor was reviewing, he went into ventricular fibrillation. You give an initial cycle of one shock at 360 J followed by 2 min of CPR, and he becomes asystolic. Blood gases taken peri-arrest reveal a pH of 6.9 and potassium of 4.9 mmol/l. Adrenaline 1 mg IV is given.

Which of the following is the optimal next step in his management?

A	Give sodium bicarbonate 8.4% IV
B	Give sodium bicarbonate 1.2% IV
C	Continue CPR
D	Give amiodarone 300mg IV
E	Give IV fluids

18526

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Calculator

Normal Values

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You are called to a cardiac arrest on the cardiac unit. A 58-year-old man was admitted 2 days previously with an anterior myocardial infarction; the nurses tell you that he was making a reasonable recovery until the onset of chest pain 30 minutes ago. As the ward doctor was reviewing, he went into ventricular fibrillation. You give an initial cycle of one shock at 360 J followed by 2 min of CPR, and he becomes asystolic. Blood gases taken peri-arrest reveal a pH of 6.9 and potassium of 4.9 mmol/l. Adrenaline 1 mg IV is given.

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A	Give sodium bicarbonate 8.4% IV
B	Give sodium bicarbonate 1.2% IV
C	Continue CPR
D	Give amiodarone 300mg IV
E	Give IV fluids

Explanation

C	Continue CPR

This man is now in asystole. The non-shockable algorithm of the ALS guidelines should therefore be followed. This emphasises high-quality CPR with adjunctive adrenaline.

A	Give sodium bicarbonate 8.4% IV

The use of sodium bicarbonate is no longer recommended as part of the ALS algorithm drawn up by the UK resuscitation council. It may, however, still be considered in cases of profound hyperkalaemia or where there is overdose of tricyclic antidepressants.

B	Give sodium bicarbonate 1.2% IV

The use of sodium bicarbonate is no longer recommended as part of the ALS algorithm drawn up by the UK resuscitation council. It may, however, still be considered in cases of profound hyperkalaemia or where there is overdose of tricyclic antidepressants.

D	Give amiodarone 300mg IV

This man is in asystole, and the non-shockable algorithm should be followed. There is no place for amiodarone in this context.

E	Give IV fluids

Where there is suspicion of hypovolaemia, e.g. after massive blood loss due to trauma, then IV fluids may be of value, but there is no suggestion that this is the case here.

18526

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Responses Correct:	0
Responses Incorrect:	77
Responses Total:	77
Responses - % Correct:	0%

External Links

Resuscitation Council UK. Resuscitation Gudelines; Adult Advanced Life Supp...
resus.org.uk/resuscitation-guidelines/adult-advanced-life-support/

Use of Sodium Bicarbonate in Cardiac Arrest: Current Guidelines and Literatu...
ncbi.nlm.nih.gov/pmc/articles/PMC4780490/

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A 28-year-old IV heroin abuser is admitted to the Emergency Department. He has been suffering from fevers for the past few days and is feeling very unwell. There is a history of a flu-like illness which resolved about a week ago. On further questioning he admits to problems finding an injecting site and has recently taken to using groin vessels. On examination he looked emaciated, with a BMI calculated at 16. Cardiovascular examination reveals a murmur consistent with pulmonary regurgitation. Respiratory examination suggested pockets of infection consistent with pneumonia.

Investigations:

Hb	10.1 g/dl
MCV	97 fl
WCC	11.2 $x10^9$/l (Neut 8.2 $x10^9$/l)
N^{a+}	135 mmol/l
K^+	5.4 mmol/l
Creatinine	185 mol/l
Urea	10.1 mmol/l
ESR	87 mm/1st hr
CXR	Multiple areas of patchy consolidation consistent with pneumonia with abscess formation

Which of the following is the most likely diagnosis in this case?

A	*Klebsiella* pneumonia
B	*Streptococcus pneumoniae* pneumonia
C	*Streptococcus bovis* endocarditis
D	*Staphylococcus aureus* endocarditis
E	*Pseudomonas* endocarditis

18528

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Investigations:

Hb	10.1 g/dl
MCV	97 fl
WCC	11.2 x10^9/l (Neut 8.2 x10^9/l)
Na^+	135 mmol/l
K^+	5.4 mmol/l
Creatinine	185 mol/l
Urea	10.1 mmol/l
ESR	87 mm/1st hr
CXR	Multiple areas of patchy consolidation consistent with pneumonia with abscess formation

Which of the following is the most likely diagnosis in this case?

A	*Klebsiella* pneumonia
B	*Streptococcus pneumoniae* pneumonia
C	*Streptococcus bovis* endocarditis
D	*Staphylococcus aureus* endocarditis
E	*Pseudomonas* endocarditis

Explanation

D	*Staphylococcus aureus* endocarditis

The most likely diagnosis is *S. aureus* endocarditis. This man is an IV drug abuser, with evidence of poor injection technique and right-sided valvular disease. Often right-sided endocarditis leads to septic emboli distributed via the pulmonary vasculature, and the chest X-ray findings would be consistent with this. In contrast, left-sided endocarditis is more commonly associated with embolic phenomena involving the periphery, such as the toes or even with emboli affecting the renal or cerebral vasculature. Diagnosis is based on the collection of multiple blood cultures (at least three), and imaging of affected valves via echocardiography. Choice of antibiotics depends upon local policy, but a regime suitably targeted against *S. aureus* would be appropriate in this case.

A	*Klebsiella* pneumonia

This condition is most commonly seen in those with underlying conditions such as alcoholism, diabetes or COPD. It is associated with sputum production, which features haemoptysis more commonly than other bacterial pneumonias. CXR changes are most commonly seen in the upper lobes.

B	*Streptococcus pneumoniae* pneumonia

The presence of abscesses makes this a less likely diagnosis, and it does not explain the patient's murmur.

C	*Streptococcus bovis* endocarditis

This organism is most commonly isolated in patients with colon cancer.

E	*Pseudomonas* endocarditis

Pseudomonas is most commonly seen in those with pre-existing conditions such as cystic fibrosis, and as a hospital-acquired pathogen. It is uncommon in those who were previously healthy. *Pseudomonas* infection is also associated with a characteristic skin lesion (ecthyma gangrenosum). It presents acutely and usually requires surgical treatment.

18528

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Session Progress

Responses Correct:	0
Responses Incorrect:	78
Responses Total:	78
Responses - % Correct:	0%

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A 64-year-old man with a long history of IHD and cardiac failure is reviewed in the cardiology clinic. He unfortunately still has symptoms of shortness of breath on exercise and is dyspnoeic at night, despite being managed with ramipril 10 mg daily, carvedilol 12.5 mg BD, digoxin 125 mcg daily, spironolactone 25 mg daily and furosemide 80 mg daily. On examination his BP is 104/60 mmHg, with a pulse of 50 bpm, and his chest is clear.

Investigations:

Hb	13.2 g/dl
WCC	4.8 $x10^9$/l
PLT	304 $x10^9$/l
Na^+	139 mmol/l
K^+	4.9 mmol/l
Creatinine	175 μmol/l
ECG	Sinus rhythm, QRS widening (155ms)
Ejection fraction	28%
PaO_2	9 kPa

Which of the following is the most appropriate management for him based on the available information?

A	Offer morphine to relieve his shortness of breath
B	Start home oxygen therapy
C	Increase his furosemide to 160mg daily
D	Add metolazone to his regime
E	Consider cardiac resynchronisation therapy

18632

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Calculator

Normal Values

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A 64-year-old man with a long history of IHD and cardiac failure is reviewed in the cardiology clinic. He unfortunately still has symptoms of shortness of breath on exercise and is dyspnoeic at night, despite being managed with ramipril 10 mg daily, carvedilol 12.5 mg BD, digoxin 125 mcg daily, spironolactone 25 mg daily and furosemide 80 mg daily. On examination his BP is 104/60 mmHg, with a pulse of 50 bpm, and his chest is clear.

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D Add metolazone to his regime

E Consider cardiac resynchronisation therapy

Explanation

E Consider cardiac resynchronisation therapy

According to current guidelines, this patient fits the drug therapy, ECG and echocardiographic criteria for cardiac resynchronisation therapy. This is usually with permanent dual-chamber pacing, although certain patients at high risk of ventricular arrhythmias and cardiac arrest may receive an implantable cardioverter defibrillator instead.

A Offer morphine to relieve his shortness of breath

While morphine can be considered as an adjunctive/palliative therapy for patients with heart failure, it is not the most appropriate option in this case as the patient meets the criteria for CRT implantation.

B Start home oxygen therapy

We are told his PaO_2 is 9, which is above the current threshold for consideration of instituting home oxygen therapy.

C Increase his furosemide to 160mg daily

We are not given evidence of fluid overload, and it is worth noting that this gentleman's creatinine is raised at 175. SIGN are clear that the diuretic dose chosen or reached should eliminate ankle or pulmonary oedema without dehydrating the patient and placing them at risk of renal dysfunction or hypotension.

D Add metolazone to his regime

We are not given evidence of fluid overload, and this gentleman is already taking two diuretic agents. ESC guidance states that a mineralocorticoid antagonist (MRA), i.e. spironolactone/eplerenone, is always preferred.

18632

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Difficulty: Average

Peer Responses %

Session Progress

Responses Correct:	0
Responses Incorrect:	79
Responses Total:	79
Responses - % Correct:	0%

External Links

European Society of Cardiology - Acute and Chronic Heart Failure
escardio.org/Guidelines/Clinical-Practice-Guidelines/Acute-and-Chronic-Heart-Failure

SIGN. Chronic Heart Failure
sign.ac.uk/pdf/SIGN147.pdf

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A 76-year-old man with a history of chronic asthma managed with high-dose seretide comes to the A&E complaining of palpitations. He has felt very faint, with shortness of breath for the past 30 min. Two further episodes occur during his time in the Emergency Department, documented as fast atrial fibrillation. By the time you examine him his BP is 135/80 mmHg, with pulse 80/min regular. ECG at that time reveals sinus rhythm with evidence of lateral ST depression.

Which of the following is the most appropriate treatment for him to prevent a relapse?

A	Bisoprolol
B	Amiodarone
C	Ivabradine
D	Verapamil
E	Adenosine

20529

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Calculator

Normal Values

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D	Verapamil
E	Adenosine

Explanation

D	Verapamil

Verapamil is a non-dihydropridine calcium antagonist which is an appropriate choice to obtain long-term ventricular rate control.

A	Bisoprolol

Beta blockers should be used with caution in patients with asthma, and this is therefore not the most appropriate option for this patient.

B	Amiodarone

Amiodarone, while a highly effective anti-arrhythmic agent, is limited by long-term systemic side effects, and current guidelines recommend use of other anti-arrhythmic agents as first line before the introduction of amiodarone.

C	Ivabradine

This is a 'funny channel' blocker used in the management of angina and heart failure. It has been used off-licence in treatment of atrial fibrillation but is not recommended under current guidelines (which in fact state that use of ivabradine has been associated with increased rates of atrial fibrillation).

E	Adenosine

Adenosine is a short-acting agent which serves to cause a transient AV block. It can be useful in terminating transient tachy-arrhythmias, and in the diagnosis of the underlying rhythm in cases of SVT of uncertain aetiology. It would not be the most appropriate choice as prophylactic agent here.

20529

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Difficulty: Average

Peer Responses %

Session Progress

Responses Correct:	0
Responses Incorrect:	80
Responses Total:	80
Responses - % Correct:	0%

External Links

2016 ESC guidelines for the management of atrial fibrillation
academic.oup.com/eurheartj/article/37/38/2893/2334964/2016-ESC-Guidelines-for-...

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A 60-year-old man presents to the casualty department with a history of headaches and palpitations. He has mild bilateral ankle swelling. Three weeks previously he was diagnosed by his GP as having hypertension and started on a new medication for this according to current guidelines.

Investigations:

Hb	12.1 g/dl
WCC	5.0 $x10^9$/l
PLT	220 $x10^9$/l
Na^+	140 mmol/l
K^+	4.5 mmol/l
Creatinine	102 µmol/l

Given his new symptoms, which of the following is the most likely medication that he was commenced on?

A	Atenolol
B	Prazosin
C	Amlodipine
D	Bendroflumethiazide
E	Ramipril

20554

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Calculator

Normal Values

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A Atenolol

B Prazosin

C Amlodipine

D Bendroflumethiazide

E Ramipril

Explanation

C Amlodipine

Amlodipine is a calcium antagonist, and is a first-line agent for the treatment of hypertension in this age group (>55 years). It is also most likely to cause ankle swelling, therefore making it the most probable agent here.

An ACE inhibitor is recommended as first-line treatment of hypertension in patients under 55 years; for patients >55 years, or for black patients of any age, a calcium antagonist should be chosen as a first step.

A Atenolol

Beta-blockers are not a preferred initial therapy for hypertension, though they may be considered in younger people such as women of child-bearing age. Beta-blockers are also strongly recommended in the treatment of hypertension in those with recent MI, and preferred in patients with other IHD.

B Prazosin

This is an alpha-blocker used in the management of BPH, and in combination with other drugs in the treatment of resistant hypertension. It is not recommended as a first line anti-hypertensive agent.

D Bendroflumethiazide

This is a thiazide diuretic and is not a first-line anti-hypertensive choice. NICE recommend that a thiazide-like diuretic, such as chlortalidone or indapamide, should be given in preference to a conventional thiazide diuretic such as bendroflumethiazide or hydrochlorothiazide. While CCB is the first-line recommendation, if there is intolerance to CCB or evidence or risk of heart failure, then a thiazide-like diuretic would be a suitable first-line choice.

E Ramipril

This is an ACE inhibitor and would be a suitable choice as first-line agent for those under 55 years of age. As this patient is 60, current guidelines recommend use of a calcium channel blocker as first line.

20554

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Difficulty: Average

Peer Responses %

Session Progress

Responses Correct:	0
Responses Incorrect:	81
Responses Total:	81
Responses - % Correct:	0%

External Links

ESC guidelines on the management of Arterial Hypertension
escardio.org/Guidelines/Clinical-Practice-Guidelines/Arterial-Hypertension-Managem...

Hypertension and heart failure
evidence.nhs.uk/formulary/bnf/current/2-cardiovascular-system/25-hypertension-an...

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A 17-year-old traveller attends the Emergency Department because he feels tired, lethargic and short of breath. You understand that his mother removed him from the hospital soon after the birth and he did not receive a full paediatric pre-discharge examination. You understand too that he has had no formal medical care and has spent the past few years travelling around the UK and Ireland with his community.

On examination he looks thin and tired; his right arm BP is 145/92 mmHg. There is a late systolic murmur which appears loudest over the thoracic spine. He has bilateral basal crackles consistent with heart failure, and mild pitting ankle oedema. A plain chest radiograph appears to show evidence of scalloping of the posterior ribs.

Which of the following is the most likely diagnosis?

A	Hypertrophic obstructive cardiomyopathy
B	Mitral regurgitation
C	Coarctation of the aorta
D	Ostium secundum atrial septal defect
E	Aortic stenosis

20555

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Normal Values

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E	Aortic stenosis

Explanation

C	Coarctation of the aorta

Whilst the classical sign of coarctation of the aorta is said to be radio-femoral delay, or differential blood pressures, we are not given this information here. Hence we have to make our diagnosis on the fairly limited information given. We are told that he is a traveller, which opens up a number of options with respect to congenital heart disease diagnoses, given that his mother did not wait for a paediatric check on the child and he has not used health services since. We are told that there is a late systolic murmur, loudest over the thoracic spine, and this is indeed a characteristic feature of coarctation of the aorta. Scalloping of the posterior ribs on CXR is another feature of long-standing coarctation. Echocardiography, coupled with magnetic resonance angiography, would be appropriate radiological investigations.

A	Hypertrophic obstructive cardiomyopathy

Signs would typically include large a waves in the JVP, a double apex impulse, loud S4, the presence of S3 and a late systolic murmur due to outflow tract obstruction (± mitral regurgitation), which increases in intensity with valsalva.

B	Mitral regurgitation

This would classically produce a 'blowing' pansystolic murmur, often with a reduced or absent S1, heard loudest at the apex with radiation to the axilla. It may be associated with signs such as atrial fibrillation and ventricular hypertrophy.

D	Ostium secundum atrial septal defect

Patients are often asymptomatic during early life and present in their 3rd or 4th decade. It is associated with right ventricular heave, a murmur loudest in the pulmonic area (which is usually a flow murmur related to excess volume over a normal pulmonary valve), and a split S2.

E	Aortic stenosis

This would classically produce an ejection systolic murmur heard loudest in the aortic area with radiation to the carotids. There may be associated signs such as a 'heaving' apex beat, slow rising pulse or the presence of an S4.

20555

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Responses Correct:	0
Responses Incorrect:	82
Responses Total:	82
Responses - % Correct:	0%

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A 34-year-old patient is admitted with an episode of cardiac chest pain lasting 40 min, which resolved just before admission. He has a history of coarctation of the aorta, which was repaired some years ago. He has been well since this time, taking minimal medication for the treatment of hypertension. He is haemodynamically stable with a BP of 115/70 mmHg and a pulse of 75/min.

Investigations:

Hb	12.1 g/dl
WCC	5.0 $x10^9$/l
PLT	230 $x10^9$/l
Na^+	139 mmol/l
K^+	4.5 mmol/l
Creatinine	120 µmol/l
ECG	No acute changes
CXR	unremarkable

Which of the following is the most appropriate initial course of action?

A	Trans-oesophageal echocardiogram
B	3 h high-sensitivity troponin
C	Discharge
D	Exercise tolerance test
E	CT Thorax

20600

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Normal Values

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C	Discharge
D	Exercise tolerance test
E	CT Thorax

Explanation

B 3 h high-sensitivity troponin

Due predominantly to changes in blood flow after coarctation repair, patients may suffer accelerated coronary artery disease quite late after surgery. As such, given that the pain has now gone and the ECG shows no acute changes, this patient should at least be observed until a 3 h troponin is available. Other possibilities include late presenting re-coarctation; as such, if the troponin is normal, this patient may well progress to angiography anyway.

A Trans-oesophageal echocardiogram

While it may prove appropriate to perform a TOE later in this patient's work-up, it would not be the most appropriate initial test and may not be required if a TEE were to prove diagnostic.

C Discharge

This patient has presented with acute chest pain in the context of previous surgery. Despite the resolution of his symptoms, it would be appropriate to undertake a period of investigation and perform a troponin.

D Exercise tolerance test

While it may prove appropriate to perform an ETT later in the course of this patient's work-up, it would not prove the most valuable initial test.

E CT Thorax

While it may prove appropriate to perform a CT thorax to rule out re-coarctation, it would seem prudent to await a troponin prior to consideration of further imaging. There is no suggestion from this patient's history of dissection, etc, that would warrant urgent imaging.

20600

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Session Progress

Responses Correct:	0
Responses Incorrect:	83
Responses Total:	83
Responses - % Correct:	0%

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A 71-year-old man is admitted to the Emergency Department with cardiac failure. He suffered a myocardial infarction 6 weeks earlier and current medication includes ramipril 10 mg daily, aspirin 75 mg and atorvastatin 40 mg daily. Other past medical history of note includes severe COPD and chronic renal impairment. He appears lucid, although he is extremely short of breath and wants to discuss his resuscitation status.

Which of the following would have the most impact on the decision regarding a DNACPR order in this case?

A	Age
B	Co-morbidities
C	Patient's wish to be resuscitated no matter what
D	The patient's family's wishes
E	The views of his power of attorney

20641

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Calculator

Normal Values

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A	Age
B	Co-morbidities
C	Patient's wish to be resuscitated no matter what
D	The patient's family's wishes
E	The views of his power of attorney

Explanation

B	Co-morbidities

Whilst selected elderly patients may do as well as younger patients post-resuscitation, those with co-morbidities have a survival to hospital discharge of only around 5%. The key is in open discussion with the patient and their family, in order to reach a shared decision. This is emphasised by the recent court cases of Tracey vs Cambridge University Hospitals NHSFT [2014] and Winspear v City Hospitals Sunderland NHSFT [2015].

A	Age

While it can be considered as part of the decision-making prcess, the BMA/RCN/Resus Council Guidance is clearthat "blanket policies that deny CPR or apply CPR to groups of people, for example to all patients above or below a certain age, are unethical and probablu unlawful. It is imprtant to consider the patient as a whole and not make decisions solely based on factors such as age.

C	Patient's wish to be resuscitated no matter what

While it is, of course, vitally important to take into consideration the views of the patient, if it is felt that resuscitation would be futile on clinical grounds, or not in your patient's best interests, there is no obligation on the treating team to offer it.

D	The patient's family's wishes

While it is, of course, vitally important to take into consideration the views of the patient's family (and particularly where these differ from those of the patient, careful discussion is key), if it is felt that resuscitation would be futile on clinical grounds, or not in your patient's best interests, there is no obligation to offer it.

E	The views of his power of attorney

We are told that this patient is lucid and keen to discuss his recuscitation status. We are not given any indication that he lacks capacity, which is the point at which a power of attorney would take effect. However, it remains important that the views of those close to the patient are sought and considered in the decision-making process.

20641

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Session Progress

Responses Correct:	0
Responses Incorrect:	84
Responses Total:	84
Responses - % Correct:	0%

External Links

Discussing resuscitation decisions
gmc-uk.org/guidance/28734.asp

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A 70-year-old man is reviewed in the clinic some 6 weeks after admission with an acute ischaemic stroke. He has made an almost complete recovery, although he is left with poor coordination affecting his right hand. Previous TIAs before the permanent event are noted. Medication includes ramipril 10 mg daily, atorvastatin 10 mg daily and aspirin 75 mg daily, which he was taking before the event. On examination his BP is 145/82 mmHg.

Investigations:

Hb	12.1 g/dl
WCC	5.0 x10^9/l
PLT	231 x10^9/l
Na^+	140 mmol/l
K^+	5.0 mmol/l
Creatinine	131 μmol/l
ESR	11 mm/hr
Carotid USS	<70% stenosis bilaterally
ECHO	Good LV function, no dilatation
ECG	Old inferior infarct, sinus rhythm

Which of the following is the intervention that is most appropriate to reduce his future risk of stroke?

A	Increase aspirin to 300mg
B	Switch aspirin to clopidogrel
C	Add dipyridamole to his aspirin therapy
D	Add warfarin
E	Refer for carotid endarterectomy

20642

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Calculator

Normal Values

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C	Add dipyridamole to his aspirin therapy
D	Add warfarin
E	Refer for carotid endarterectomy

Explanation

B Switch aspirin to clopidogrel

While clopidogrel is first line as secondary prevention, NICE recommend that aspirin 75 mg daily may be used if both clopidogrel and modified-release dipyridamole are contraindicated or cannot be tolerated. There is no place in the NICE guidance for aspirin 300 mg.

A Increase aspirin to 300mg

While clopidogrel is first line as secondary prevention, NICE recommend that aspirin 75 mg daily may be used if both clopidogrel and modified-release dipyridamole are contraindicated or cannot be tolerated. There is no place in the NICE guidance for aspirin 300 mg.

C Add dipyridamole to his aspirin therapy

While NICE guidance states that aspirin 75 mg daily with modified-release dipyridamole 200 mg twice daily may be used if clopidogrel cannot be tolerated, we are not given any indication here that clopidogrel is an unsuitable choice.

D Add warfarin

This patient is in sinus rhythm, with no suggestion of an arrhythmia that would warrant anticoagulation.

E Refer for carotid endarterectomy

NICE recommends that patients with stable neurological symptoms from acute non-disabling stroke or TIA and who have symptomatic carotid stenosis <70%, according to the ECST criteria, should not undergo surgery.

20642

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Difficulty: Average

Peer Responses %

Session Progress

Responses Correct:	0
Responses Incorrect:	85
Responses Total:	85
Responses - % Correct:	0%

External Links

Stroke and TIA
cks.nice.org.uk/stroke-and-tia

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A 19-year-old student with a history of asthma is admitted from a night club with palpitations. He does not admit to having taken any alcohol or illicit drugs. On further questioning he also seems to have suffered palpitations on two or three occasions at night over the past few months, but says that these resolved spontaneously, on one occasion he went to A&E for an ECG. On examination he has a BP of 110/70 mmHg, and his pulse rate on the monitor is 170/min. He is not in cardiac failure.

Investigations;

Hb	12.9 g/dl
WCC	5.2 $x10^9$/l
PLT	195 $x10^9$/l
Na+	140 mmol/l
K+	4.9 mmol/l
Creatinine	100 mol/l
ECG	SVT, ventricular rate 170/min (previous ECG on casualty attendance, normal sinus rhythm)

Which of the following is the most appropriate agent for chemical cardioversion?

A	Adenosine
B	Esmolol
C	Sotalol
D	Amiodarone
E	Verapamil

20950

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Calculator

Normal Values

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A 19-year-old student with a history of asthma is admitted from a night club with palpitations. He does not admit to having taken any alcohol or illicit drugs. On further questioning he also seems to have suffered palpitations on two or three occasions at night over the past few months, but says that these resolved spontaneously, on one occasion he went to A&E for an ECG. On examination he has a BP of 110/70 mmHg, and his pulse rate on the monitor is 170/min. He is not in cardiac failure.

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C	Sotalol
D	Amiodarone
E	Verapamil

Explanation

The answer is Verapamil -

Both of the beta blockers listed here, esmolol and sotolol would be potentially suitable therapy options here in cardiac terms alone, but the history of asthma precludes their use. Similarly, use of adenosine is not recommended in patients with asthma. Verapamil blocks calcium influx in the slow channels of the AV node, decreases conduction velocity and prolongs the refractory period, thus increasing the chances of achieving sinus rhythm. Given that verapamil is given as an IV bolus, versus amiodarone being administered by infusion, verapamil is the preferred option here.

20950

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Difficulty: Average

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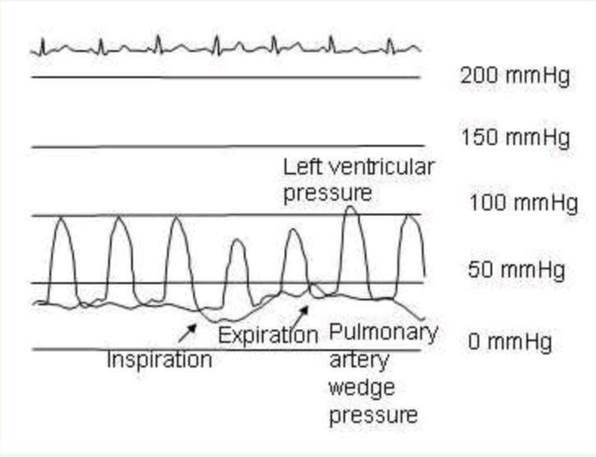
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Responses Correct:	0
Responses Incorrect:	86
Responses Total:	86
Responses - % Correct:	0%

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A 52-year-old woman who has received chemotherapy and radiotherapy for previous Hodgkin's lymphoma 20 years ago presents to the clinic complaining of shortness of breath, feeling faint and gradually increasing ankle swelling. On examination she looks short of breath, her systolic BP is 100 mmHg, but there is a decrease of 20mmHg on inspiration.

Investigations;
ECG – Low voltage sinus tachycardia
Cardiac catheterization:



Which of the following is the most likely diagnosis?

A	Pericardial fibrosis
B	Myocarditis
C	Dilated cardiomyopathy
D	Pericardial effusion
E	Constrictive pericarditis

21011

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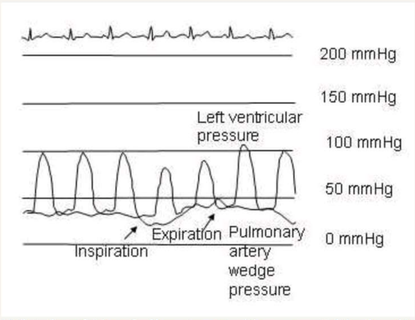
Calculator

Normal Values

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Cardiac catheterization:



Which of the following is the most likely diagnosis?

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B	Myocarditis
C	Dilated cardiomyopathy
D	Pericardial effusion
E	Constrictive pericarditis

Explanation

This woman has pulsus paradoxicus, with a significant drop in BP on inspiration. This is confirmed on the diagram which shows the left ventricular pressure falls significantly on inspiration. From the options given pericardial effusion is the most likely cause. It is likely that she received a substantial dose of midline radiotherapy as part of her Hodgkin's treatment. A recognised late complication is inflammatory pericarditis with effusion. Given this woman's substantial functional impairment as a result of the effusion, she is likely to require drainage of the effusion and surgical pericardectomy.

21011

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Responses Correct:	0
Responses Incorrect:	87
Responses Total:	87
Responses - % Correct:	0%

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A 60-year-old man with heart failure comes to the clinic. Current medication includes furosemide 80 mg OD, spironolactone 50 mg OD, bisoprolol 5 mg OD and ramipril 10 mg OD. He has had increased shortness of breath over the past 3 months and is now housebound, only able to live downstairs and move from room to room. On examination his BP is 100/70 mmHg, with a pulse of 55/min. He has late inspiratory crackles in both lung fields on auscultation, and bilateral swollen ankles. A transthoracic echocardiogram shows a left ventricular ejection of 30%.

Investigations:

Hb	11.4 g/dl
WCC	5.0 $x10^9$/l
PLT	130 $x10^9$/l
Na^+	139 mmol/l
K^+	4.9 mmol/l
Creatinine	155 µ mol/l
ECG	Sinus rhythm, with QRS 160 ms
CXR	Evidence of bilateral pulmonary oedema, cardiomegaly
Ejection fraction	30%

Which of the following is the most appropriate intervention to improve mortality?

A	Implantation of an implantable cardioverter defibrillator (ICD)
B	Implantation of a single chamber pacemaker
C	Initiate low-dose digoxin
D	Implantation of a cardiac re-synchronisation therapy (CRT) device
E	Increase furosemide dose

21023

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Calculator

Normal Values

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A 60-year-old man with heart failure comes to the clinic. Current medication includes furosemide 80 mg OD, spironolactone 50 mg OD, bisoprolol 5 mg OD and ramipril 10 mg OD. He has had increased shortness of breath over the past 3 months and is now housebound, only able to live downstairs and move from room to room. On examination his BP is 100/70 mmHg, with a pulse of 55/min. He has late inspiratory crackles in both lung fields on auscultation, and bilateral swollen ankles. A transthoracic echocardiogram shows a left ventricular ejection of 30%.

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D	Implantation of a cardiac re-synchronisation therapy (CRT) device
E	Increase furosemide dose

Explanation

D	Implantation of a cardiac re-synchronisation therapy (CRT) device

This patient has developed significant heart failure and appears to be on maximum medical therapy at present. His mild bradycardia limits his ability to tolerate up-titration of his beta-blockade. The presence of a broad LBBB picture on his ECG suggests that ventricular contraction is likely to be uncoordinated. In such patients, implantation of a cardiac re-synchronisation (CRT) device will improve mortality and has been shown to improve symptoms (judged by NYHA class). See Table 1 for full recommendations.

Table 1: Options for implantation of ICD or CRT devices in patients with heart failure and left ventricular dysfunction with a left ventricular ejection fraction of ⩽35%. NYHA – New York Heart Association Class of heart failure symptoms. CRT-D – cardiac resynchronisation therapy device with defibrillator capability. CRT-P – cardiac resynchronisation therapy device with pacemaker capability only. ICD – implantable cardioverter defibrillator. *Suggested by presence of positive family history of long-QT syndrome hypertrophic cardiomyopathy, Brugada syndrome or arrhythmogenic right ventricular cardiomyopathy. Adapted from National Institute for Health and Care Excellence TA314 – Implantable cardioverter defibrillators and cardiac resynchronisation therapy for arrhythmias and heart failure.

	NYHA Class			
QRS duration	I	II	III	IV
<120 ms	ICD if high risk of sudden cardiac death*			ICD and CRT not clinically indicated
120-149 ms (no LBBB)	ICD			CRT-P
120-149 ms (LBBB)	ICD	CRT-D	CRT-P or CRT-D	
⩾150 ms (±LBBB)	CRT-D			

Cleland JGF et al. The effect of cardiac resynchronization on morbidity and mortality in heart failure. *N Engl J Med*. 2005;352:1539-49.

National Institute for Health and Care Excellence TA314 – Implantable cardioverter defibrillators and cardiac resynchronisation therapy for arrhythmias and heart failure. June 2014

A	Implantation of an implantable cardioverter defibrillator (ICD)

Patients with significant heart failure are at risk of developing clinically significant ventricular arrhythmias and associated sudden cardiac death. However, ICD therapy alone (compared with defibrillation capability built into a CRT device) is recommended only for patients with heart failure who do not have findings suggestive of significant mechanical dis-synchrony. Full details of patients recommended for ICD vs CRT therapy are detailed in Table 1.

National Institute for Health and Care Excellence TA314 – Implantable cardioverter defibrillators and cardiac resynchronisation therapy for arrhythmias and heart failure. June 2014.

B	Implantation of a single chamber pacemaker

This patient has a mild bradycardia with no indication of heart block on ECG. As such, there does not appear to be an indication for pacemaker implantation. Furthermore, single-lead ventricular pacing in this patient may exacerbate the ventricular dis-synchrony which may in turn worsen their heart failure.

C	Initiate low-dose digoxin

Digoxin has been shown to reduce hospitalisation when given for heart failure; however, the DIG trial did not demonstrate any benefit in all-cause mortality, and a meta-analysis of digoxin in heart failure has suggested an increase in mortality. Further, digoxin's mode of action is through competitive binding with K^+ ions and the Na^+/K^+ ATPase pump can inhibit AV-node depolarisation, which would worsen this patient's mild bradycardia.

E	Increase furosemide dose

Furosemide and other loop-diuretics have not been shown to have any significant benefit in mortality for patients with heart failure. This contrasts with potassium-sparing diuretics (such as spironolactone), which do have a mortality benefit when added to beta-blockers and ACE inhibitors in the management of chronic heart failure. Furthermore, in the case of this patient, the low systolic blood pressure would mean that the addition of significant further doses of furosemide may well be poorly tolerated.

References:

Peakcock WF, et al. Impact of intravenous loop diuretics on outcomes of patients hospitalized with acute decompensated heart failure: insights from the ADHERE registry. *Cardiology*. 2009;113:12-19.

Pitt B, et al. The effect of spironolactone on morbidity and mortality in patients with severe heart failure. *N Engl J Med*. 1999;341:709-11.

21023

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Responses Total:	88
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External Links

Implantable cardioverter defibrillators and cardiac resynchronisation therapy...
nice.org.uk/guidance/ta314

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A 68-year-old woman presents to the Emergency Department after a collapse in the local supermarket. Apparently she had attended a few months earlier with a similar episode. She had suffered an inferior myocardial infarction seven years ago but was otherwise relatively well. Other past history of note includes the development of paroxysmal atrial fibrillation three years earlier. Medication includes ramipril 10 mg OD, aspirin 75 mg OD, indapamide 1.5 mg OD, bisoprolol 2.5 mg OD and atorvastatin 10 mg ON. She also takes ranitidine for indigestion. On examination in the Emergency Department she looks relatively well, her pulse is 62/min and regular with a BP of 115/72 mmHg.

Investigations:

Hb	12.1 g/dl
WCC	5.6 $x10^9$/l
PLT	156 $x10^9$/l
Na^+	140 mmol/l
K^+	5.0 mmol/l
Creatinine	120 µ mol/l

ECG shows second-degree heart block.

A 24 h tape while on the ward shows two episodes of complete heart block, both occurring at night, the longest episode lasting 8 s.

Which of the following is the most appropriate intervention?

A	Stop bisoprolol and discharge
B	Single chamber pacemaker
C	Dual chamber pacemaker
D	Stop bisoprolol and observe as an inpatient
E	Stop ranitidine and discharge

21029

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Calculator

Normal Values

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A	Stop bisoprolol and discharge
B	Single chamber pacemaker
C	Dual chamber pacemaker
D	Stop bisoprolol and observe as an inpatient
E	Stop ranitidine and discharge

Explanation

C Dual chamber pacemaker

This patient presents with two episodes of collapse associated with second-degree heart block with periods of complete heart block. Although cessation of her beta-blocker may have some benefit to her symptoms it is unlikely to completely resolve her clinical situation. As such, implantation of a pacemaker is required. Given that her atrial fibrillation is paroxysmal, she is likely to benefit from a dual-chamber pacemaker.

A Stop bisoprolol and discharge

The use of bisoprolol in this patient may have exacerbated her underlying cardiac rhythm. However, stopping this therapy is unlikely to resolve her rhythm abnormalities or symptoms completely. Additionally, bisoprolol has a positive mortality benefit following this patient's myocardial infarction and should be continued if possible. Given repeated episodes of collapse and positive findings on her 24 h tape, this option would be insufficient.

B Single chamber pacemaker

This patient does require implantation of a pacemaker given her symptoms and ECG findings. However, a dual-chamber pacemaker allows for both atrial and ventricular pacing. In patients that have organised atrial activity this is beneficial. If her atrial fibrillation was long-standing, persistent or permanent in nature, then a single-change device could be considered.

D Stop bisoprolol and observe as an inpatient

As with Option A, stopping the low dose of bisoprolol is unlikely to completely resolve her symptoms or ECG findings. Although observing this patient rather than discharging immediately may be of some benefit, these should be considered for a dual-chamber pacemaker in the first instance.

E Stop ranitidine and discharge

Ranitidine has been shown to induce bradycardia in some patients, and case reports of syncope induced by ranitidine have been published. However, given the history of an inferior myocardial infarction (which is most likely to damage the AV node), it is unlikely that the use of ranitidine is primarily responsible for the recurrent collapses in this lady.

References:

Camarri E, et al. Ranitidine induced bradycardia. *Lancet*. 1982;320:160.

Radhamanohar M. Syncope caused by ranitidine-induced increase in A-V block. *Postgrad Med J*. 1993;69:500.

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A 59-year-old man presents to the Emergency room with central crushing chest pain radiating to both arms. He is sweaty and vomiting. There is a past history of hypertension for which he takes ramipril 10mg daily and he smokes 20 cigarettes per day. On examination his BP is 110/70 mmHg, his pulse is 62/min. He has pulmonary oedema.

Investigations;

Hb	13.1 g/dl
WCC	5.0 x109/l
PLT	199 x109/l
Na+	139 mmol/l
K+	4.9 mmol/l
Creatinine	120 mol/l

ECG – Widespread anterior ST elevation

He is recovering post PCI on the CCU when you are asked to see him by the nurses. There is persistent slowing of his pulse to 40. A repeat ECG demonstrates complete heart block and resolved ST elevation. You give him atropine 3mg but it makes little difference.

Which of the following is the most appropriate intervention?

A	External pacing
B	Further atropine 1mg
C	Adrenalin
D	Isoprenaline
E	Temporary pacing wire

21030

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Calculator

Normal Values

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Which of the following is the most appropriate intervention?

A	External pacing
B	Further atropine 1mg
C	Adrenalin
D	Isoprenaline
E	Temporary pacing wire

Explanation

The answer is - Temporary pacing wire

Unfortunately in this case, unlike the case in inferior myocardial infarction, there is a significant likelihood of permanent complete heart block here. Whereas in the context of inferior MI, heart block may just be indicative of temporary ischaemia and may thus resolve after supportive management and thrombolysis, in anterior MI it is indicative of extensive infarction. Therefore rather than attempting external pacing it is most appropriate to manage him with a temporary pacing wire, which may need to be converted to permanent pacing after a few days.

21030

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Responses - % Correct:	0%

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A 72-year-old woman who has known biventricular failure and left atrial dilatation on ECG, COPD and peripheral vascular disease is admitted in fast AF with a ventricular rate of 154/min. In view of low chances of successful chemical cardioversion you elect to begin treatment with digoxin. You load her with 500 micrograms digoxin IV and then a further 250 micrograms over 6 h. On examination her BP is 132/72 mmHg, her heart rate is now 128/min and she feels well.

Investigations:

Hb	12.8 g/dl
WCC	4.9 $x10^9$/l
PLT	206 $x10^9$/l
Na^+	141 mmol/l
K^+	4.9 mmol/l
Creatinine	132 µ mol/l

What is the most appropriate option with respect to her digoxin dosing?

A	Stop the digoxin and commence metoprolol
B	Initiate digoxin 125micrograms PO OD
C	Give a further loading dose of digoxin 250 micrograms IV
D	Add amiodarone 200 mg TDS to the regimen
E	Give a further loading dose of digoxin 500 micrograms IV

21179

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Calculator

Normal Values

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C	Give a further loading dose of digoxin 250 micrograms IV
D	Add amiodarone 200 mg TDS to the regimen
E	Give a further loading dose of digoxin 500 micrograms IV

Explanation

C Give a further loading dose of digoxin 250 micrograms IV

Digoxin helps control ventricular rate in atrial fibrillation through competitive blockade of the K^+ site on the Na^+/K^+ ATPase. This slows conduction through the AV node. Digoxin has a high volume of distribution and long half-life (36-48 h), which means that loading doses are required to allow the drug to reach a steady-state concentration more quickly. Although this patient has symptomatically improved, her heart rate remains elevated and a further loading dose of digoxin is required.

A Stop the digoxin and commence metoprolol

Metoprolol is a beta-blocker which can be used for rate control of atrial fibrillation in some patients. However, this patient has a background of COPD; the use of a beta-blocker in this group may exacerbate her COPD and reduce the effectiveness of salbutamol reliever inhalers.

B Initiate digoxin 125micrograms PO OD

Digoxin has a high volume of distribution and a long half-life (36-48 h). In this patient the half-life is likely to be further elongated due to her renal dysfunction. If initiated on a maintenance dose of digoxin at this point, it will take several days to reach a steady state. Digoxin dose should be titrated to heart rate in atrial fibrillation; this patient's heart rate remains elevated and it is likely that the plasma concentration of digoxin remains insufficient. As such, a further loading dose is required.

D Add amiodarone 200 mg TDS to the regimen

The main role of amiodarone in the management of atrial fibrillation is through chemical cardioversion to sinus rhythm. This is unlikely to occur in a patient with significant left atrial dilatation. Furthermore, the use of amiodarone in conjunction with digoxin can increase the plasma levels of digoxin (by impairing renal digoxin clearance), which will already be elevated in this patient with reduced renal function.

E Give a further loading dose of digoxin 500 micrograms IV

A further loading dose of digoxin is required. Digoxin is almost exclusively renally cleared; as a result, this patient's renal impairment will significantly alter the half-life of this medication. Given the significant benefit the patient has already obtained from the current doses and the narrow therapeutic range of digoxin, the use of a 250 microgram loading dose is the more appropriate option.

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A 38-year-old woman who is 30 weeks pregnant is admitted with central crushing chest pain, sweating and vomiting of 3hrs duration. She smoked 20 cigarettes per day prior to her pregnancy and has continued to smoke 10 cigarettes per day since becoming pregnant. Her father suffered a myocardial infarction at the age of 48. On examination she has a BP of 100/50 mmHg, looks pale and sweaty. Her pulse is 60/min regular and she is not in cardiac failure. During the examination she suffers a VF arrest which responds to one DC shock.

Investigations;

Hb	11.0 g/dl
WCC	5.9 $x10^9$/l
PLT	179 $x10^9$/l
Na^+	139 mmol/l
K^+	4.2 mmol/l
Creatinine	95 µ mol/l
ECG	Anterior ST elevation consistent with STEMI

Which of the following is the most appropriate management for her?

A	Angioplasty
B	LMW Heparin
C	rTPA
D	IV amiodarone
E	Tirofiban

21183

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Calculator

Normal Values

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A 38-year-old woman who is 30 weeks pregnant is admitted with central crushing chest pain, sweating and vomiting of 3hrs duration. She smoked 20 cigarettes per day prior to her pregnancy and has continued to smoke 10 cigarettes per day since becoming pregnant. Her father suffered a myocardial infarction at the age of 48. On examination she has a BP of 100/50 mmHg, looks pale and sweaty. Her pulse is 60/min regular and she is not in cardiac failure. During the examination she suffers a VF arrest which responds to one DC shock.

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E	Tirofiban

Explanation

There is very limited data on the management of acute myocardial infarction in pregnancy because of its rarity. Whilst there is little placental transfer of TPA, reports of thrombolysis indicate a number of cases of maternal haemorrhage, subchorionic haemorrhage, placental abruption, uterine bleeding and sudden unexplained foetal loss. In contrast acute angioplasty in one case series of 92 was associated with favourable outcome in all except one patient who suffered a coronary dissection and progressed to CABG.

JACC Vol 52 issue 3, July 2008, 171-180

21183

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Responses Correct:	0
Responses Incorrect:	92
Responses Total:	92
Responses - % Correct:	0%

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A 72-year-old woman was admitted to the Emergency room with her second fall in 3 months. She was discharged home, but an astute SHO ordered a 24hr tape as an outpatient. You review her in the clinic. She has a history of hypertension which is managed with ramipril and indapamide and she reports episodes of dizziness and fast palpitations over the past few months. On examination she looks slim, her BP is 155/84 mmHg, pulse is 82/min sinus rhythm. She is not in cardiac failure.

Investigations;

Hb	12.4 g/dl
WCC	5.1 $x10^9$/l
PLT	198 $x10^9$/l
Na^+	140 mmol/l
K^+	4.9 mmol/l
Creatinine	110 µmol/l
TSH	2.5 U/l
Resting ECG	Sinus rhythm, no acute changes but inferior Q waves identified
24hr tape	short periods of paroxysmal AF, pauses of up to 4 seconds

How would you plan to initially manage the patient with respect to her rhythm disturbance?

A	Aspirin
B	Digoxin
C	Amiodarone
D	Warfarin
E	Referral for pacemaker

21199

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Calculator

Normal Values

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How would you plan to initially manage the patient with respect to her rhythm disturbance?

A	Aspirin
B	Digoxin
C	Amiodarone
D	Warfarin
E	Referral for pacemaker

Explanation

Pauses of up to 3 seconds may be accepted, but longer pauses in this context, coupled with short periods of paroxysmal AF and the history of falls suggest that this woman may be suffering from Sinus Node Disease (SND). The treatment plan for SND usually needs to take account of both the problems with tachycardia, and the episodes of heart block. In the first instance it would seem sensible therefore to arrange pacemaker insertion prior to starting warfarin therapy or medication to maintain sinus rhythm which is likely to precipitate bradycardia.

21199

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Responses Correct:	0
Responses Incorrect:	93
Responses Total:	93
Responses - % Correct:	0%

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A 78-year-old woman with a history of ischaemic heart disease and left ventricular failure is admitted with urinary sepsis. According to her daughter she has been unwell for some days and is now drowsy and confused. On examination she looks dry, she is pyrexial 38.2°C, and is agitated when you press over her lower abdomen. Her BP is 95/50 mmHg and her pulse is 98/min.

Investigations;

Hb	13.9 g/dl
WCC	13.1 x10^9/l
PLT	94 x10^9/l
Na^+	139 mmol/l
K^+	5.6 mmol/l
Creatinine	225 µmol/l
Urine	white cells ++, protein +, red cells +

You arrange admission to the ITU for monitoring of fluid balance. **Which of the following cardiac catheterisation results would fit with this clinical picture?**

A	Pulmonary artery systolic pressure 44 mmHg
B	Left ventricular systolic pressure 95 mmHg
C	Right atrial pressure 15 mmHg
D	Pulmonary artery wedge pressure 0 mmHg
E	Right ventricular pressure 23 mmHg

21202

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Calculator

Normal Values

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B	Left ventricular systolic pressure 95 mmHg
C	Right atrial pressure 15 mmHg
D	Pulmonary artery wedge pressure 0 mmHg
E	Right ventricular pressure 23 mmHg

Explanation

This patient almost certainly has gram negative sepsis as a result of urinary tract infection; she is dry because of poor fluid intake, and gram negative sepsis leads to further decreases in arterial pressure and perfusion. These two factors have led to the pre-renal failure seen here. The pulmonary artery systolic pressure seen here is too high and consistent with raised pulmonary artery pressure; the right ventricular pressure is in the normal range, although you might expect in this situation for it to be lower because of poor venous return. The left ventricular pressure of 95 mmHg is lower than you might expect, and corresponds to this clinical situation; hence B is the correct answer.

21202

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A 23-year-old homeless patient comes to the Emergency room. She has been feeling sick for some considerable time with fevers and rigors and has now begun to develop a rash. On examination she is pyrexial 38.1° C. She has splinter haemorrhages on examination of her finger nails and a generalized purpuric rash. Further examination reveals injection sites on both forearms and evidence that she has tried to inject into her femoral vein.

Investigations;

Hb	10.0 g/dl
WCC	12.4 $x10^9$/l
PLT	35 $x10^9$/l
Na^+	139 mmol/l
K^+	4.5 mmol/l
Creatinine	152 mol/l
ESR	70 mm/hr
Blood cultures x3	negative
Urine	blood +
CXR	Cavitating lesions both lower lobes

Which of the following is the most appropriate next investigation?

A	Further blood cultures
B	CT thorax
C	Trans-oesophageal echocardiogram
D	Urine cultures
E	ANA

21203

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Explanation

This unfortunate girl is a heroin addict, and with poor needle hygiene has introduced bacteria, most likely staphylococcus aureus into the right side of the circulation. This will have introduced right sided valvular endocarditis, with seeding of bacteria into the pulmonary circulation. This then results in multiple cavitating lung abscesses, as seen on CXR. Vasculitis, leading to the purpuric rash and haematuria is a common epiphenomenon associated with staphylococcal infection. Trans-oesophageal echocardiogram is the diagnostic modality of choice.

21203

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A 32-year-old Romanian man presents to the Emergency room complaining of shortness of breath and tiredness. He tells you that this has been increasing over the past 6 months. He also complains of a chronic cough. On examination his BMI is 21 and he looks tired. His BP is 110/70 mmHg and his resting pulse is 80/min. He has bilateral ankle oedema.

Investigations:

Hb	10.5 g/dl
WCC	11.6 $x10^9$/l
PLT	201 $x10^9$/l
Na^+	138 mmol/l
K^+	4.5 mmol/l
Creatinine	120 µ mol/l
ECG	Low voltage complexes, nil else of note
ECHO	pericardial effusion
Effusion fluid	Lymphocytes ++

Which of the following is the most likely diagnosis?

A	Autoimmune pericarditis
B	Viral pericarditis
C	Restrictive cardiomyopathy
D	Tuberculous pericarditis
E	Amyloidosis

21210

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Calculator

Normal Values

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C	Restrictive cardiomyopathy
D	Tuberculous pericarditis
E	Amyloidosis

Explanation

Tuberculous pericarditis is the commonest cause of constrictive pericarditis worldwide. The increased prevalence of tuberculosis in Eastern Europe, the chronic cough and raised white count all lead us towards the diagnosis. We aren't given the CXR as part of the investigations, but clearly CXR, sputum culture for AAFBs and culture of the pericardial effusion for tuberculosis would all be crucial to the work up of this case. He should be managed aggressively with quadruple anti-microbial therapy. In the context of the chronic cough and Eastern European origin, tuberculosis is more likely versus autoimmune pericarditis. Amyloidosis leads to pericardial thickening, not seen here. Viral pericarditis has a shorter course of symptoms versus the 6 months duration reported here.

21210

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Responses Total:	96
Responses - % Correct:	0%

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A 41-year-old bond trader is brought to the Emergency room by ambulance with crushing central chest pain, nausea, vomiting and collapse. He smokes 20 cigarettes per day and uses daily cocaine. On examination his BP is 180/72 mmHg, his pulse is 95/min and he looks very unwell. He has bilateral crackles at both lung bases.

Investigations;

Hb	13.1 g/dl
WCC	6.7 $x10^9$/l
PLT	167 $x10^9$/l
Na^+	139 mmol/l
K^+	4.5 mmol/l
Creatinine	100 µ mol/l
Troponin	3.0 µ g/l
ECG	Anterior ST elevation consistent with acute MI
Coronary artery angiography	Left main stem, flow decreased by 85%, but no focal lesion identified

Which of the following is the most appropriate immediate management with respect to his chest pain?

A	Aspirin
B	LMW heparin
C	rTPA
D	Atenolol
E	GTN

21211

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Which of the following is the most appropriate immediate management with respect to his chest pain?

A	Aspirin
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E	GTN

Explanation

This patient has coronary artery vasospasm as a result of cocaine use. Management of choice is with nitrates and/or calcium channel blockers. In this case given his presentation, IV GTN would be most appropriate. Whilst there is low flow, there is no evidence of acute occlusion, so rTPA would not be appropriate. Beta blockade may actually worsen vasoconstriction in some patients and therefore should be avoided in this situation. Long-term prognosis depends on giving up the cocaine habit. Smoking and cocaine use in combination is thought to contribute to development of accelerated atherosclerosis.

21211

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A 52-year-old man with a history of diabetes mellitus had a bare metal stent inserted after an inferior myocardial infarction. Three months later he is admitted with a further episode of chest pain. Troponin at 12 h is negative. On examination his BP is 140/82 mmHg, his pulse 72/min and regular. He is not clinically in heart failure. An exercise test is performed, which reveals inferolateral ST depression.

Which of the following is the most likely diagnosis?

A	In-stent thrombosis
B	New coronary artery disease distal to the stent
C	Coronary artery emboli
D	In-stent re-stenosis
E	Coronary artery vasospasm

21225

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Normal Values

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C	Coronary artery emboli
D	In-stent re-stenosis
E	Coronary artery vasospasm

Explanation

D	In-stent re-stenosis

Bare metal stent re-stenosis occurs more commonly in patients with diabetes mellitus. Coated or drug-eluting stents are now recommended for use in patients with cardiac risk factors, such as diabetes.

Coated stents may also be associated with late re-stenosis in diabetes mellitus, particularly in the context of discontinuation of clopidogrel (in patients who are aspirin resistant). It is also advised that dual anti-platelet therapy with both aspirin and clopidogrel should be continued for at least a year after the procedure.

A	In-stent thrombosis

This is more common in diabetic patients and with bare metal stents than with coated stents. It is less common at this quite early stage post-procedure, and tends to coincide with cessation of anti-platelet medication.

B	New coronary artery disease distal to the stent

This is unlikely given the short time frame, though longer term in such a patient with significant risk factors, this could become a problem. Indeed, the presence of a stent in a coronary artery may induce inflammatory changes in the vessel wall that make subsequent CABG higher risk.

C	Coronary artery emboli

These are more common in atrial fibrillation. There is, in fact, a lower prevalence of classical cardiac risk factors such as hypertension, diabetes mellitus, smoking and dyslipidaemia in coronary emboli than other causes of myocardial ischaemia and infarction (see reference below).

E	Coronary artery vasospasm

Also known as Prinzmetal angina, this occurs in cycles and is due to spasming contraction of coronary vessel wall smooth muscle. It causes ST elevation on ECG and may result in elevated cardiac enzymes following prolonged attacks.

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External Links

Prevalence, Clinical Features, and Prognosis of Acute Myocardial Infarction A...
doi.org/10.1161/CIRCULATIONAHA.114.015134

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A 61-year-old patient was admitted with central crushing chest pain radiating down his left arm. He has a history of hypertension treated with atenolol and smokes 20 cigarettes per day. On examination his BP was 100/60 mmHg with a pulse of 38/min (Complete heart block). ECG revealed inferior ST elevation. He was paced and given rTPA. Some 4hrs later you are asked to see him as he has continued to have further dull chest pain most recently accompanied by a period of bradycardia. His BP is now 85/60 mmHg, his pulse is 90/min. You notice that his JVP is elevated. There are no signs of left ventricular failure.

Investigations;

Hb	13.1 g/dl
WCC	8.2 $x10^9$/l
PLT	199 $x10^9$/l
Na^+	138 mmol/l
K^+	4.9 mmol/l
Creatinine	156 µ mol/l
ECG	Inferolateral ST changes, similar to the post TPA ECG

What is the most likely diagnosis?

A	Right coronary artery dissection
B	Right ventricular rupture
C	Tricuspid regurgitation
D	Right ventricular infarction
E	Ventricular septal defect

21226

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Calculator

Normal Values

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What is the most likely diagnosis?

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C	Tricuspid regurgitation
D	Right ventricular infarction
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Explanation

The presentation with initial complete heart block followed by hypotension with a raised JVP is highly suggestive of right ventricular infarction. Whilst the other answers are all possible occurrences, in terms of probability, right ventricular infarction is the most likely. Management includes optimising right ventricular filling pressure, and closely monitoring pressures with a pulmonary artery catheter where appropriate. Once filling is optimised, if hypotension persists, addition of inotropes may be required.

21226

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A 65-year-old man with a history of cigarette smoking (40 pack-years) and type 2 diabetes presents with pain in both calves and feet. He reports calf pain on walking to the pub over the past few months, but says that the pain became much worse a few weeks ago and is now also present at rest. He also has suffered with pins and needles in his feet for 2-3 years. He takes a PDE-5 inhibitor for erectile dysfunction. On examination his distal foot pulses are not easily palpable. Capillary return is poor in both feet and there is an absence of hair. His arches have dropped and his feet show evidence of bony deformity. There is an ulcer on his right great toe with evidence of surrounding infection and oedema. His BP is measured at 155/85 mmHg, with a pulse of 75/min, AF.

Investigations:

Hb	12.1 g/dl
WCC	6.2×10^9/l
PLT	201×10^9/l
Na^+	140 mmol/l
K^+	4.9 mmol/l
Creatinine	192 μ mol/l
HbA_1c	77.05 mmol/mol (9.2%)
ABPI	0.4 – both legs

Which of the following is the most likely cause of his pain?

A	Peripheral neuropathic pain
B	Chronic arterial insufficiency
C	Mixed arterial disease and neuropathy
D	Peripheral arterial emboli
E	Osteomyelitis

21275

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Calculator

Normal Values

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A Peripheral neuropathic pain

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C Mixed arterial disease and neuropathy

D Peripheral arterial emboli

E Osteomyelitis

Explanation

B Chronic arterial insufficiency

The patient has suffered calf claudication for many months, which has progressed to pain at rest. The ABPI has fallen into the critical zone (<0.5) - he therefore requires arterial ultrasound and an arteriogram. There may be lesions that are amenable to angioplasty at the time of angiography, otherwise he may require referral for bypass surgery.

It is also noted that his creatinine is elevated at 192 µmol/l, which puts him at significantly increased risk of contrast nephropathy. It would be important to ensure the patient is adequately hydrated before the procedure to reduce this risk.

A Peripheral neuropathic pain

Although there is evidence of peripheral neuropathy with paraesthesia in the feet, ulcers and fallen arches, this is unlikely to be the cause of the pattern of pain described here.

C Mixed arterial disease and neuropathy

Although an accurate diagnosis for the overall condition of this patient, it is the chronic arterial insufficiency that accounts for the presentation of claudication progressing to chronic pain.

D Peripheral arterial emboli

These would present as an acute ischaemic limb with the classical signs thereof: pain, pallor, pulseless, paraesthesia and paralysis. Diagnosis would be confirmed with Doppler ultrasound or angiography of the affected limb.

E Osteomyelitis

This patient is at high risk of osteomyelitis due to impaired sensation, impaired healing and the presence of infection around the ulcer. The normal white cell count (WCC) reduces the likelihood of this diagnosis, although in chronic infection inflammatory markers may not be elevated. An MRI scan of the foot would be needed to diagnose osteomyelitis of this patient's toe.

21275

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A 62-year-old man presents with fatigue. He reports periods in the day when he feels absolutely washed out. He tries to keep himself fit, walking several miles every day, but is finding it virtually impossible to keep up his usual exercise schedule. He denies loss of consciousness or dizziness. Medication of note includes amlodipine and indapamide for hypertension. On examination his BP is 125/75 mmHg, with pulse 75/min and regular. Cardiovascular and respiratory examination is unremarkable.

Investigations:

Hb	12.3 g/dl
WCC	5.4×10^9/l
PLT	205×10^9/l
Na^+	140 mmol/l
K^+	4.8 mmol/l
Creatinine	110 μmol/l
72 h ECG	Three periods of complete heart block, each occurring while asleep, with pauses lasting for 3 s or longer, one as long as 5 s

Which of the following is the most appropriate intervention?

A	Stop amlodipine
B	Arrange review in 6 months time
C	Admit for permanent pacing
D	Start midodrine
E	Stop indapamide

21276

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Calculator

Normal Values

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Explanation

C Admit for permanent pacing

Although this patient has not yet had a syncopal episode, he has significant pauses lasting for greater than 3 s associated with episodes of complete heart block. Therefore the most appropriate management is permanent pacing.

A Stop amlodipine

Calcium channel blockers may be associated with complete heart block, but this is more likely with non-dihydropyridine agents such as verapamil and diltiazem. Therefore stopping amlodipine is unlikely to resolve the problem.

B Arrange review in 6 months time

No intervention would leave this patient with a life-threatening arrhythmia and potential for sudden cardiac death.

D Start midodrine

This is an a1 agonist used in the treatment of orthostatic hypotension. There would be no indication for its use in this scenario.

E Stop indapamide

This medication may be associated with hyponatraemia and the consequent symptoms, but is not known to cause heart block.

21276

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A 72-year-old man comes to the clinic for review. He has severe biventricular failure and is taking ramipril 10 mg, furosemide 160 mg, spironolactone 25 mg, digoxin 62.5 mcg and bisoprolol 10 mg. On examination he looks a little dry, his BP is 110/72 mmHg lying and 95/65 mmHg on standing. There is no peripheral oedema and no crackles on auscultation of the chest.

Investigations:

Hb	12.1 g/dl
WCC	5.0×10^9/l
PLT	208×10^9/l
Na^+	140 mmol/l
K^+	5.6 mmol/l
Creatinine	210 mol/l (165 at last clinic appointment)
Urea	13.1 mmol/l

Which of the following agents should be reduced in dose or discontinued?

A	Ramipril
B	Furosemide
C	Spironolactone
D	Digoxin
E	Bisoprolol

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Normal Values

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A	Ramipril
B	Furosemide
C	Spironolactone
D	Digoxin
E	Bisoprolol

Explanation

B	Furosemide

This patient's renal function has deteriorated since his last clinic appointment, with rising urea and creatinine suggesting pre-renal failure. Given there are no clinical signs of heart failure, the most sensible first modification to this patient's medications would be to reduce the dose of furosemide. After reducing the dose it is important to monitor U&Es regularly. His potassium is elevated at 5.6 mmol, but this might be expected to fall as the pre-renal failure resolves; however, it is important to remember that it may remain elevated due to continued use of spironolactone.

A	Ramipril

This is an ACE inhibitor known to improve mortality in heart failure. It can be implicated in the development of renal failure, and U&E should be monitored throughout its use.

C	Spironolactone

This is a potassium-sparing diuretic - a competitive antagonist of aldosterone at the receptor site in the DCT. It is associated with hyperkalaemia, and potassium levels should be monitored carefully in this patient. It increases serum concentrations of digoxin.

D	Digoxin

Digoxin levels may increase in the presence of renal failure, and therefore it would be important to monitor for signs of toxicity, or indeed digoxin levels. With mild renal failure, the dose is unlikely to require changing and digoxin is not implicated in the development of renal failure. It is used in heart failure because it improves symptoms and prevents hospital admissions.

E	Bisoprolol

This provides control of heart rate and prevents arrhythmias in heart failure. It also conveys some survival benefit and improves symptoms. Dose should be reduced when eGFR <20 ml/min.

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A 63-year-old woman with congestive cardiac failure comes to the clinic for review. She has had two previous myocardial infarctions. Regular medications include ramipril 10 mg, furosemide 80 mg, bisoprolol 10 mg, digoxin 125 bmcg and spironolactone 25 mg. On examination, BP is 142/82 mmHg, pulse is 80/min regular and she has bibasal crackles consistent with left ventricular failure and bilateral pitting oedema of the ankles.

Investigations:

Hb	11.9 g/dl
WCC	5.4×10^9/l
PLT	210×10^9/l
Na^+	140 mmol/l
K^+	4.9 mmol/l
Creatinine	135 mol/l

Which of the following is the most appropriate management for her?

A	Reduce bisoprolol
B	Increase spironolactone
C	Increase furosemide
D	Increase digoxin
E	Increase bisoprolol

21278

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Calculator

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B	Increase spironolactone
C	Increase furosemide
D	Increase digoxin
E	Increase bisoprolol

Explanation

C Increase furosemide

This patient is relatively hypertensive, with evidence of decompensated heart failure and fluid overload. The most appropriate initial management is to increase in her diuretic therapy and relieve the symptoms of fluid overload – pulmonary and peripheral oedema.

A Reduce bisoprolol

This is unlikely to be of any benefit as her symptoms are not related to b-blockade. Bisoprolol is used as an adjunct in heart failure, with doses starting at 1.25 mg per day, titrated up to 10 mg per day over several weeks.

B Increase spironolactone

Spironolactone is associated with an increased risk of hyperkalaemia. While spironolactone in combination with an ACE inhibitor or ARB has been shown to improve mortality in heart failure, this effect is not dose dependent - studies suggest that increasing the dose of spironolactone above the minimum does not improve outcome.

D Increase digoxin

This may be considered over the longer term, but there is no indication to do so in this situation. It would not change her current symptoms, which are related to fluid overload. Digoxin improves symptoms and mortality in heart failure. The recommended dose for this indication is 125-250 micrograms per day.

E Increase bisoprolol

This is not advised as the patient is already on the maximum dose recommended in heart failure.

It is worth noting the elevated creatinine. Many of the drugs used in heart failure cause renal failure or need dose adjustment in the presence thereof. If making any alterations to this lady's medications, renal function should be monitored regularly.

21278

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A 73-year-old woman comes for review in cardiology clinic with her husband. He is very worried because she passed out after getting out of her chair to go to the toilet. He reports that she went pale and then collapsed, hitting her head on the floor. She had around 20-30 seconds of twitching and was incontinent of urine. She has a history of hypertension for which she takes ramipril 5 mg daily. Her BP in the clinic is 155/90 mmHg; otherwise cardiovascular examination is unremarkable. Neurological examination is entirely normal.

Investigations:

Hb	13.1 g/dl
WCC	5.4×10^9/l
PLT	201×10^9/l
Na^+	140 mmol/l
K^+	4.4 mmol/l
Creatinine	130 mol/l
Resting ECG	Old inferior infarct, otherwise normal
CXR	Slight cardiomegaly but nil else of note

Which of the following investigations is most likely to reveal the underlying cause of her collapse?

A	72 h ECG monitoring
B	Tilt table test
C	CT head
D	24 h BP recording
E	EEG

21427

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A 73-year-old woman comes for review in cardiology clinic with her husband. He is very worried because she passed out after getting out of her chair to go to the toilet. He reports that she went pale and then collapsed, hitting her head on the floor. She had around 20-30 seconds of twitching and was incontinent of urine. She has a history of hypertension for which she takes ramipril 5 mg daily. Her BP in the clinic is 155/90 mmHg; otherwise cardiovascular examination is unremarkable. Neurological examination is entirely normal.

Investigations:

Hb	13.1 g/dl
WCC	5.4 × 10^9/l
PLT	201 × 10^9/l
Na^+	140 mmol/l
K^+	4.4 mmol/l
Creatinine	130 mol/l
Resting ECG	Old inferior infarct, otherwise normal
CXR	Slight cardiomegaly but nil else of note

Which of the following investigations is most likely to reveal the underlying cause of her collapse?

A	72 h ECG monitoring
B	Tilt table test
C	CT head
D	24 h BP recording
E	EEG

Explanation

B	Tilt table test

The history here is typical of orthostatic hypotension. The twitching and incontinence witnessed by her husband are most likely related to the syncopal event, rather than a primary neurological problem. The tilt table allows for very accurate measurement of pulse and blood pressure moving from a supine to a standing position. Tilt table testing will reveal bradycardic or hypotensive carotid body syndrome, which can then be managed with appropriate intervention.

A	72 h ECG monitoring

This is used to investigate cardiac arrhythmias, which may present with syncope similar to that described above. It does not provide any information about blood pressure, which is key to identifying the cause of this lady's postural symptoms.

C	CT head

It would be tempting to perform a CT scan of this lady's head given the history of head injury and preceding loss of consciousness, with some features suggestive of seizure activity. In this case it would not play any diagnostic role.

D	24 h BP recording

This is usually used in the diagnosis of hypertension, where recordings in the GP surgery or clinic are variable and unreliable. It may well identify this lady's postural drop, but would not be the most efficient way to do this.

E	EEG

This is used to diagnose epilepsy. The clinical scenario described here does not suggest that this lady is having seizures.

21427

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A 54-year-old man is referred by his GP for routine cardioversion after a new diagnosis of atrial fibrillation. He has not required rate control. At presentation his heart rate is 75/min, AF, BP 142/82 mmHg. There are no signs of cardiac failure or respiratory tract infection.

Investigations:

Hb	12.9 g/dl
WCC	7.2×10^9/l
PLT	288×10^9/l
Na^+	141 mmol/l
K^+	4.2 mmol/l
Creatinine	130 mol/l
TSH	3.1 U/l (<0.5-4.5)
Echocardiogram	Normal left atrial size, no significant valvular disease

Which of the following is the most appropriate plan with respect to his anti-coagulation, given the planned admission for cardioversion in 1 month?

A	Aspirin and clopidogrel 6 weeks pre- and until 1 month after the procedure
B	Low-molecular weight heparin for 72 h pre- and then 48 h post- the procedure
C	Low-molecular weight heparin while being warfarinised, then continue warfarin for 6 months after the procedure
D	Low-molecular weight heparin while being warfarinised, then continue warfarin for 1 year after the procedure
E	Low-molecular weight heparin while being warfarinised, then review need for continued anti-coagulation at 1-month follow-up

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Explanation

E	Low-molecular weight heparin while being warfarinised, then review need for continued anti-coagulation at 1-month follow-up

Evidence suggests that 1/3 of patients who are successfully cardioverted to sinus rhythm revert to atrial fibrillation during the first month after cardioversion. This puts them at significant risk of thromboembolic events. This patient is in a high potential success group because of his normal echocardiogram, with normal left atrial size and lack of significant valvular disease, and absence of other cardiac risk factors.

Warfarin takes several days to reach therapeutic levels, so he will need initial treatment with LMWH until this is achieved. He can then be maintained on warfarin until review at 1 month, when his anti-coagulation can be reassessed. If he is still in sinus rhythm and has no further symptoms of palpitations, anticoagulation can be discontinued.

A	Aspirin and clopidogrel 6 weeks pre- and until 1 month after the procedure

Dual antiplatelet therapy (aspirin and clopidogrel) is not indicated for management of AF. It is used as secondary prevention in CVD following MI, CVE and angina.

B	Low-molecular weight heparin for 72 h pre- and then 48 h post- the procedure

The short duration of treatment with this option, just 72 h pre- and 48 h post-procedure, would not be adequate given the high risk of developing a clot pending cardioversion. It would also make cardioversion in one month's time unsafe, as clots may have formed in the left atrium during the period of AF, which can dislodge at cardioversion causing CVE.

C	Low-molecular weight heparin while being warfarinised, then continue warfarin for 6 months after the procedure

Longer-term anticoagulation even after successful cardioversion is indicated for higher-risk patients. The decision is based on patient factors and CHA2DS2-VASc score.

D	Low-molecular weight heparin while being warfarinised, then continue warfarin for 1 year after the procedure

Longer-term anticoagulation even after successful cardioversion is indicated for higher-risk patients. The decision is based on patient factors and CHA2DS2-VASc score.

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Responses Total:	105
Responses - % Correct:	0%

External Links

NICE Guidelines
nice.org.uk/guidance/cg180

BMJ Best Practice
bestpractice.bmj.com/best-practice/monograph/3/treatment/step-by-step.html

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A 73-year-old woman collapses on the ward 24 h following permanent pacemaker insertion. She had been stable after the procedure, which was performed for collapse and episodes of complete heart block detected on 72 h tape. On examination she is pyrexial at 37.8°C, BP 88/50 mmHg, HR 110/min and thready. Her JVP is elevated.

Investigations:

Hb	10.8 g/dl
WCC	8.8×10^9/l
PLT	201×10^9/l
Na^+	139 mmol/l
K^+	4.9 mmol/l
Creatinine	120 mol/l
pH	7.38
pO_2	12.1 kPa
pCO_2	4.2 kPa

Which of the following is the most likely diagnosis?

A	Pulmonary embolus
B	Septic shock
C	Acute myocardial infarction
D	Cardiac tamponade
E	Acute mitral regurgitation

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Calculator

Normal Values

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Which of the following is the most likely diagnosis?

A Pulmonary embolus

B Septic shock

C Acute myocardial infarction

D Cardiac tamponade

E Acute mitral regurgitation

Explanation

D Cardiac tamponade

This patient is in cardiogenic shock because of the pacing wire piercing the myocardium and subsequent cardiac tamponade. This is a rare complication of pacemaker insertion. Hypotension, tachycardia, low-volume pulse and elevated JVP are all consistent with this diagnosis. Management is urgent echocardiography and drainage of the haematoma. In this context, pyrexia is most likely to be related to the collection of blood. The most common complications early post-pacemaker insertion include bleeding/haematoma, phlebitis, lead dislodgement, infection, pneumothorax, haemothorax, myocardial perforation and air embolism.

A Pulmonary embolus

This could present with the features described above, and her recent admission and procedure would be risk factors for this. Acute massive PE can cause tachycardia, hypotension and pyrexia with elevated JVP. Treatment would be thrombolysis – which, if administered in this scenario, could lead to fatal consequences.

B Septic shock

This patient is in shock, and quick assessment of the cause is key to her management. Septic shock is defined as organ dysfunction secondary to 'dysregulated response to infection'. Diagnosis is based on evidence of organ dysfunction: altered mental state, respiratory rate and blood pressure (see reference below).

C Acute myocardial infarction

This can present as cardiogenic shock. It would easily be diagnosed on ECG and requires urgent PCI.

E Acute mitral regurgitation

This tends to present as acute left ventricular failure with pulmonary oedema. The classical murmur of mitral regurgitation (pansystolic, high-pitched) is likely to be present.

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Responses Total:	106
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A 72-year-old man attends the GP around 1 week after right hemicolectomy for colonic carcinoma, feeling generally unwell. He has been suffering from sweats, particularly at night, and is feeling increasingly lethargic. On examination he has pyrexia (37.8°C) and a pan-systolic murmur.

Investigations:

Hb	10.3 g/dl
WCC	12.1×10^9/l
PLT	145×10^9/l
Na^+	139 mmol/l
K^+	4.5 mmol/l
Creatinine	180 μmol/l
ESR	77 mm/hr
Trans-oesophageal ECHO	Mitral valve vegetations

Which of the following is the most likely responsible organism?

A	*Bacteroides fragilis*
B	*Staphylococcus aureus*
C	*Staphylococcus epidermidis*
D	*Streptococcus viridans*
E	*Pseudomonas*

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Calculator

Normal Values

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D	*Streptococcus viridans*
E	*Pseudomonas*

Explanation

A *Bacteroides fragilis*

Endocarditis is a rare complication of colonic resection, which occurs due to mobilisation of gut bacteria and their entry into the bloodstream. Passage of bacteria to the heart occurs via venous drainage, so valve lesions tend to be right-sided. Vegetations may also occur on the left side of the heart, as seen here, and in this case mitral valve lesions have led to mitral regurgitation.

In the context of endocarditis following bowel resection, *Bacteroides* is the most likely organism of those listed, though *S. bovis* is also seen. The incidence of postoperative endocarditis is very low because of the use of peri-operative broad-spectrum antibiotics (usually a cephalosporin in combination with metronidazole). Management in this case is metronidazole.

B *Staphylococcus aureus*

This species is overall the most common cause of infective endocarditis, and around one third of *Staph. aureus* bacteraemia cases result in endocarditis, the majority of cases occur in structurally normal valves. The main risk factors are intravascular lines, IV drug abuse, alcoholism, cancer and chronic diseases such as diabetes or long-term steroid use. Is therefore more often associated with healthcare-acquired disease.

C *Staphylococcus epidermidis*

This tends to present as subacute disease. Although it can cause native valve disease, it is most associated with early prosthetic valve endocarditis.

D *Streptococcus viridans*

This organism is present in the mouth and is the reason that the presence of valvular heart disease may be relevant in dental procedures. It is more commonly associated with community-acquired infection. It commonly presents as subacute disease.

E *Pseudomonas*

This is a bacterium that may contaminate recreational drugs, and it is therefore associated with IV drug abuse. It has a high morbidity and mortality and high rate of relapse.

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A 57-year-old man presents to the GP with tiredness. He had a prosthetic aortic valve replacement 6 months ago. The procedure itself was uneventful, but he now feels increasingly tired and lethargic. He takes warfarin and a recent INR was 3.0. On examination he looks pale, BP 105/70 mmHg, pulse 90/min. On auscultation the prosthetic valve is easily audible. There are bilateral coarse crackles at both lung bases consistent with mild LVF.

Investigations:

Hb	9.7 g/dl
MCV	105 fl, reticulocytosis, decreased haptoglobins
WCC	5.0×10^9/l
PLT	155×10^9/l
Na^+	139 mmol/l
K^+	5.0 mmol/l
Creatinine	120 μmol/l
ESR	15 mm/hr
Alb	39 g/l
ALT	45 U/l
Bilirubin	86 μmol/l

Which of the following is the most likely diagnosis?

A	Subacute bacterial endocarditis
B	Gastrointestinal haemorrhage
C	Valve haemolysis
D	Liver abscess
E	Warfarin-related haemolytic anaemia

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Calculator

Normal Values

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Which of the following is the most likely diagnosis?

A Subacute bacterial endocarditis

B Gastrointestinal haemorrhage

C Valve haemolysis

D Liver abscess

E Warfarin-related haemolytic anaemia

Explanation

C Valve haemolysis

Valve haemolysis is associated with prosthetic valve replacement. It occurs because of mechanical destruction of red cells and leads to anaemia, with increased reticulocyte count and decreased haptoglobins. The bilirubin elevation is likely to be due to a rise in unconjugated bilirubin because of haemolysis.

A Subacute bacterial endocarditis

This can present with fatigue, but there tend to be other features such as fever, new or changing heart murmur, weight loss and vascular and immunologic phenomena. Staphylococci and bacteria of the HACEK group (*Haemophilus*, *Actinobacillus*, *Cardiobacterium*, *Eikinella* and *Kingella*) are more common causative organisms in prosthetic valve endocarditis than native valve.

B Gastrointestinal haemorrhage

This should be suspected in any patient presenting with occult anaemia, including in this case. However, blood loss tends to cause a microcytic anaemia and haptoglobins would be normal.

D Liver abscess

This condition presents with fever, right upper quadrant pain, anorexia and malaise. There are variable changes in liver function tests, with hypoalbuminaemia and elevated alkaline phosphatase being the most typical.

E Warfarin-related haemolytic anaemia

Warfarin is not known to cause a haemolytic anaemia, though may be associated with occult blood loss and consequent anaemia.

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Responses Total:	108
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A 72-year-old man with temporal headaches, hip and shoulder girdle pain presents to the Emergency department with sudden loss of vision in his right eye. He also reports pain in his jaw on eating. He has a past history of hypertension for which he takes ramipril 10mg daily. On examination he appears to have no vision in his right eye and he has 6/12 vision in his left eye. There is tenderness to palpation over both temples.

Investigations;

Hb	11.5 g/dl
WCC	10.3 $x10^9$/l
PLT	321 $x10^9$/l
ESR	79 mm/hr
Na^+	139 mmol/l
K^+	4.9 mmol/l
Creatinine	100 µmol/l
ECG	Slow AF, ventricular rate 65/min

Which of the following is the most likely cause of his loss of vision?

A	Right carotid stenosis
B	Right inflammatory optic neuritis
C	Thromboembolic disease
D	Vasculitis
E	Mastoiditis

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Normal Values

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A 72-year-old man with temporal headaches, hip and shoulder girdle pain presents to the Emergency department with sudden loss of vision in his right eye. He also reports pain in his jaw on eating. He has a past history of hypertension for which he takes ramipril 10mg daily. On examination he appears to have no vision in his right eye and he has 6/12 vision in his left eye. There is tenderness to palpation over both temples.

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B	Right inflammatory optic neuritis
C	Thromboembolic disease
D	Vasculitis
E	Mastoiditis

Explanation

This man has temporal arteritis, as evidenced by his clinical history, examination, and raised ESR. The slow AF is a red herring here, as the most likely cause of his blindness is vasculitis leading to endothelial damage and ischaemia distal to the area of arterial damage. Management of temporal arteritis involves the use of high dose steroids, and if successful, symptoms usually improve significantly within a few days of starting therapy, In patients who fail to respond to treatment, another diagnosis should be suspected. The jaw pain on eating seen here most likely represents claudication due to maxillary artery involvement.

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Responses Incorrect:	109
Responses Total:	109
Responses - % Correct:	0%

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A 73-year-old woman who felt dizzy and had a fall while at the supermarket is admitted for review. She has a past history of myocardial infarction some 20 years ago, and hypertension. Current medication includes atorvastatin 10mg, ramipril 10mg and aspirin 75mg, On examination her BP is 105/72 mmHg. Her pulse is 56/min and regular. She has no hear murmurs and is not in cardiac failure.

Investigations;

Hb	11.9 g/dl
WCC	4.3 x10^9/l
PLT	212 x10^9/l
Na^+	139 mmol/l
K^+	5.0 mmol/l
Creatinine	171 mol/l
ECG	Bifascicular block, sinus bradycardia
24hr ECG	Episodes of 3 second pause, one short episode of VT, fast atrial fibrillation

Which of the following is the most appropriate management?

A	Implantable cardioverter/ defibrillator
B	Permanent pacemaker
C	Digoxin
D	Amiodarone
E	Sotalol

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D	Amiodarone
E	Sotalol

Explanation

Bifascicular block and history of pauses on 24hr tape indicate the need for permanent pacemaker insertion. Whilst amiodarone may be a reasonable treatment for ventricular tachycardia, and sotaol for atrial fibrillation, both may worsen this lady's pauses. As such the best way to manage this patient is with a permanent pacemaker. The VT may be related to the pauses (ventricular escape occurs, and ischaemia in a susceptible patient may lead to a run of VT), and should be re-assessed after pacemaker insertion has occurred.

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Responses Correct:	0
Responses Incorrect:	110
Responses Total:	110
Responses - % Correct:	0%

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A 55-year-old male presents to the emergency department with a history of severe substernal chest pain of 4 h duration. He has been diabetic for 5 years on metformin 500 mg three times a day and has a 20-pack year history of smoking. Apart from this he has no past medical history of note.
He appears sweaty and anxious. His heart rate is 108 beats/min, blood pressure 75/50 mmHg. There is jugular venous distension and crepitations up to the lower end of scapulae and S3 gallop. An electrocardiogram (ECG) shows 2 mm ST segment elevation in leads V1 to V5 and 2 mm ST segment depression in leads II, III and aVF. Chest X-ray shows cardiomegaly and pulmonary congestion without any evidence of mediastinal widening or pericardial effusion. He is given chewable aspirin.
He remains hypotensive at 85/60 mmHg post angioplasty and still has signs of heart failure.

Which of the following is the most appropriate way to manage his blood pressure?

A	Intra-aortic balloon pump (IABP)
B	Fluid loading
C	IV adrenaline
D	IV noradrenaline
E	IV furosemide

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Explanation

This patient has presented with acute anterior myocardial infarction complicated by cardiogenic shock. Cardiogenic shock occurs in about 7% of cases of acute myocardial infarction; of these 10% have this condition at admission and 90% develop it in hospital; it carries high mortality. Management of cardiogenic shock in this setting involves circulatory support in the form of vasopressors such as IV dopamine and intra-aortic balloon pump (IABP). Given however that his symptoms have not significantly improved post revascularisation he has a poor prognosis. One thing that is established beyond doubt is that angioplasty is superior to thrombolysis in this situation. Fluid loading will worsen his LVF, IV furosemide will worsen his blood pressure and renal perfusion. Adrenaline and noradrenaline carry significant risk of exacerbating ischaemia.

32272

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Responses Total:	111
Responses - % Correct:	0%

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A 76-year-old man with a long-standing history of hypertension is referred to the Cardiology Department with a 6-month history of worsening shortness of breath on exertion and peripheral oedema. He is now unable to walk more than 20 yards without getting breathless. He finds it very uncomfortable to lie flat at night and over the last month there were a couple of nights when he woke up trying to catch his breath. He is currently on Furosemide 40 mg bd and Ramipril 5 mg od.
On arrival in the clinic his blood pressure is 145/90 mmHg, heart rate 85 beats/min regular. His heart sounds are normal on auscultation and there are bi-basal crackles on auscultation of his chest. His jugular venous pulse is seen at 4 cm and there is pitting oedema bilaterally to mid calves.
His electrocardiogram (ECG) shows sinus rhythm with left ventricular hypertrophy.
His chest X-ray confirms an enlarged cardiac shadow with evidence of left ventricular failure. Previous ECHO from 2 months ago reveals an EF of 32%.

Blood tests show:

Hb	10.2 g/dl
WCC	6.3×10^9/l
Platelets	198×10^9/l
Na^+	132 mmol/l
K^+	3.9 mmol/l
Urea	6.0 mmol/l
Creatinine	101 mol/l

Which of the following measures is the most appropriate next step in this case?

A	Increase Furosemide
B	Add Bisoprolol
C	Add Digoxin
D	Add Metolazone
E	Add Spironolactone

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Calculator

Normal Values

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E	Add Spironolactone

Explanation

This man has New York Heart Association III congestive cardiac failure. If the patient is taking a calcium antagonist such as Amlodipine (not the case here), it can precipitate peripheral oedema and fluid retention and should be withdrawn. Digoxin is a last resort in patients with no evidence of atrial fibrillation. A beta-blocker such as Bisoprolol offers great prognostic benefit but should be initiated during a stable period, rather than when there is significant fluid retention. Metolazone can be used very cautiously if there is no satisfactory diuresis on furosemide alone and preferably in an inpatient setting. Spironolactone combines a good diuretic effect with prognostic benefit as seen in the RALEs. In this case it will also help raise the patient's potassium. Alpha-blockers and nitrates are alternatives for offloading patients who do not tolerate first-line agents. Increasing furosemide is less favoured because of the potassium at the lower end of the normal range and the fact that it does not confer an outcome benefit.

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Responses Correct:	0
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Responses Total:	112
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A 70-year-old known diabetic is referred to the rapid access clinic by his general practitioner (GP) because of a three-month history of intermittent palpitations. He describes these as fast and irregular and of sudden onset and termination. He has felt quite light-headed on a couple of occasions during these palpitations but denies any chest pain or shortness of breath. The general practitioner (GP) mentions in the referral letter that he has a borderline high blood pressure and was recently started on ramipril.
Examination reveals a blood pressure of 145/95 mmHg but is otherwise unremarkable.
A routine electrocardiogram (ECG) shows sinus rhythm with left ventricular hypertrophy.

Blood tests reveal:

Hb	13.1 g/dl
WCC	5.6×10^9/l
Platelets	253×10^9/l
Na^+	136 mmol/l
K^+	4.8 mmol/l
Urea	5.0 mmol/l
Creatinine	99 mol/l
TSH	3 mU/l

A 24-h ECG reveals episodes of paroxysmal atrial fibrillation.
An echocardiogram shows concentric hypertrophy with mild impairment of left ventricular function, dilated left atrium and no significant valvular pathology.

Which one of the following would be the anti-arrhythmic of choice?

A	Flecainide
B	Bisoprolol
C	Digoxin
D	Amiodarone
E	Verapamil

32274

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Calculator

Normal Values

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C	Digoxin
D	Amiodarone
E	Verapamil

Explanation

Digoxin has little value in paroxysmal atrial fibrillation (PAF) and flecainide is contraindicated in patients with structural abnormalities and at high risk of ischaemic heart disease. Amiodarone should be reserved for refractory cases due to its side-effect profile. A beta-blocker can limit the episodes of PAF and achieve rate control during the episodes as well as being beneficial for blood pressure control and left ventricular impairment and is the treatment of choice if there are no contraindications. He should of course be warfarinised as he is at significant risk of an embolic stroke.

32274

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Responses Correct:	0
Responses Incorrect:	113
Responses Total:	113
Responses - % Correct:	0%

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A 24-year-old previously fit and well man is admitted under the care of the orthopaedic team following a road traffic accident. He was riding his motorbike when he was hit by another car and he sustained a comminuted open fracture of his left tibia and fibula. He undergoes an open reduction and fixation operation and is returned to the ward.

A week later he is found to be pyrexial at 38.9°C and tachycardic at 130 beats/min. His blood pressure is 100/60 mmHg. There are splinter haemorrhages on two of his finger nails. There is a systolic murmur on auscultation of his chest. His chest is clear on auscultation.

A bedside urine dipstick is positive for blood, protein and leucocytes. Serum creatinine is 125 micromol/l.

Given the likely cause of his fever, which of the following is the most appropriate early treatment in this case?

A	Intravenous (IV) benzylpenicillin and gentamicin
B	IV Cefuroxime and metronidazole
C	IV Vancomycin
D	IV Gentamicin and IV flucloxacillin
E	IV Clarithromycin

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Calculator

Normal Values

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C	IV Vancomycin
D	IV Gentamicin and IV flucloxacillin
E	IV Clarithromycin

Explanation

This patient has clinical features consistent with a diagnosis of infective endocarditis. After at least three sets of blood cultures have been taken from three different sites, blind treatment should be instigated pending results. The treatment is targeted to the most likely suspected organism. In this case the most likely pathogen is Staphylococcus because of his extensive trauma and initial treatment should involve flucloxacillin and gentamicin. MRSA is less likely, which is why flucloxacillin rather than vancomycin is the preferred anti-staphylococcal agent.

32275

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Responses Correct:	0
Responses Incorrect:	114
Responses Total:	114
Responses - % Correct:	0%

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A 27-year-old professional football player is admitted with a fracture of his right tibia which he sustained during the course of a match. He is put on traction in the ward and he is scheduled for theatre two days later. On the eve of the procedure he is seen by the house officer because of an episode of chest pain. Clinical examination is unremarkable. His electrocardiogram (ECG) and chest X-ray are reported as normal, and the patient is prescribed some analgesia.

The following morning the patient is taken to theatre as planned. While in the anaesthetic room, he is noted to have a respiratory rate of 25/min, and oxygen saturations of 90% on room air. His heart rate is 100 beats/min regular and his blood pressure is 90/65 mmHg. His heart sounds are normal and there are coarse crackles on auscultation of his chest bilaterally. His jugular venous pressure is raised to 5 cm. There is no peripheral oedema.

His ECG shows right axis deviation with prominent R waves on leads V1–V2.

Which one of the following measures would be the appropriate next step in this patient's management?

A	Intravenous (IV) furosemide
B	IV glyceryl trinitrate infusion
C	IV Fluids
D	Subcutaneous enoxaparin
E	IV Tissue plasminogen activator

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Normal Values

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C	IV Fluids
D	Subcutaneous enoxaparin
E	IV Tissue plasminogen activator

Explanation

This patient has symptoms and signs suggestive of acute pulmonary oedema. This is extremely unlikely to be cardiac in origin in a young athlete. In this case the most likely diagnosis is acute respiratory distress syndrome secondary to a fat embolus. Initial resuscitation should involve high flow oxygen and intravenous (iv) fluids to maintain high right ventricular filling pressures. Steroid therapy is normally introduced later in ARDS, used at this stage it can worsen pulmonary oedema, and evidence is equivocal as to benefit. Continuous positive airways pressure ventilation would help in the management of the pulmonary oedema and is the next consideration after IV fluids. It should be noted that diuretic treatment would be strongly contraindicated in this case. This is because right ventricular output is dependent on elevated filling pressures. Reducing the preload is therefore not a good idea.

32276

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Responses Correct:	0
Responses Incorrect:	115
Responses Total:	115
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An 83-year-old man is seen in the cardiology department for pre-syncopal episodes. He describes a couple of events when he felt that he was going to faint and had to sit down. There were no precipitating factors on either of these episodes. There was no associated chest pain or palpitations. In his everyday life he has a good exercise tolerance with no symptoms of chest pain on exertion, shortness of breath on exertion, orthopnoea or paroxysmal nocturnal dyspnoea.
There is a past medical history of hypertension for which he is on bendrofluazide 2.5 mg od. There is no history of ischaemic heart disease or valvular heart disease.
On examination he is comfortable with a blood pressure of 138/86 mmHg, and a heart rate of 76 beats/min, which is irregular. His heart sounds are normal and his chest is clear.
An electrocardiogram (ECG) performed shows sinus rhythm with occasional ventricular ectopics.
The patient has a 24-h ECG monitoring as an outpatient.

Which one of the following findings would be an indication for permanent pacemaker implantation?

A	Frequent ventricular ectopics
B	Sinus pauses of >3.0 s
C	Intermittent Wenckebach phenomenon
D	Paroxysmal atrial fibrillation
E	Non-sustained ventricular tachycardia

32277

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Normal Values

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D	Paroxysmal atrial fibrillation
E	Non-sustained ventricular tachycardia

Explanation

Indications for permanent pacemaker implantation include third-degree heart block, symptomatic second-degree block, asymptomatic type II second-degree block and pauses of more than 3.0 s.
Indications for implantable defibrillators (AICD) are expanding. The MADIT trial showed a 54% reduction of death in patients post-myocardial infarction (MI) with left ventricular ejection fraction (LVEF) <35% and sustained ventricular tachycardia (VT) on monitoring or inducible on Electrophysiological Studies (EPS). The AVID trial showed a 31% death reduction in patients with resuscitated VT or ventricular fibrillation (VF). Currently indications for AICD include cardiac arrest due to VF or VT, not due to a reversible cause, spontaneous sustained VT, unexplained syncope with VT inducible at EPS and non-sustained VT with prior MI.

32277

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Responses Total:	116
Responses - % Correct:	0%

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A 43-year-old man presents to the emergency department with a 1-hr history of central crushing chest pain radiating to his left arm. This has started suddenly and has been building up in intensity. He has been feeling very nauseous and sweaty and is starting to get short of breath. There is no past medical history. He smokes 30/day and drinks about 25 units per week.
On examination he is in pain, his blood pressure is 165/95 mmHg, heart rate 120/min regular, saturations of 95% on room air. His heart sounds are normal and there are bibasal crackles on auscultation of his chest.
A 12-lead electrocardiogram (ECG) shows ST elevation of 4 mm in leads V2–V5.
A portable chest X-ray shows evidence of left ventricular failure.

Which one of the following measures would offer the greatest prognostic benefit in this patient in the immediate few hours after admission?

A	Thrombolysis with streptokinase
B	Thrombolysis with tissue plasminogen activator (tPA)
C	Immediate primary angioplasty
D	Atenolol 25 mg
E	Ramipril 5 mg

32278

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Calculator

Normal Values

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B	Thrombolysis with tissue plasminogen activator (tPA)
C	Immediate primary angioplasty
D	Atenolol 25 mg
E	Ramipril 5 mg

Explanation

The patient has an acute anterior myocardial infarction (MI) leading to acute left ventricular failure (LVF). Aspirin 300 mg stat and immediate primary angioplasty if the option is available are the two measures that offer the greatest prognostic benefit in the early hours. If in a setting where primary angioplasty is not an option, thrombolytic therapy should be instigated as early as possible, although the fact that angioplasty has such a superior outcome versus thrombolysis has driven the government to increase provision significantly across the UK. Tissue plasminogen activator (tPA) is preferable to streptokinase in the case that thrombolysis is the only option. In the long run following an MI ß-blockers and angiotensin-converting enzyme inhibitors as well as statins should of course form part of the treatment regime.

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Responses Incorrect:	117
Responses Total:	117
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A 19-year-old girl presents with exertional breathlessness and palpitations. On examination there are giant v waves on inspection of her jugular venous pulse (JVP) and a left parasternal heave on palpation of her chest. Her heart sounds are normal and her chest is clear.
She undergoes an echocardiogram that confirms the presence of elevated right-sided pressures with tricuspid regurgitation.

She undergoes a left and right heart catheter which yields the following data:

Sample site	Oxygen saturations (%)
Inferior vena cava	62
Superior vena cava	58
Right atrium	80
Right ventricle	78
Pulmonary artery	78
Arterial saturation	97

Given these data which is the likeliest diagnosis?

A	Patent ductus arteriosus
B	Primary pulmonary hypertension
C	Patent foramen ovale
D	Mitral stenosis
E	Chronic pulmonary thromboembolism

32279

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D	Mitral stenosis
E	Chronic pulmonary thromboembolism

Explanation

The oxygen saturation data show a step-up in the saturations between the vena cava and the right atrium. This signifies the existence of a left to right shunting of oxygenated blood at the level of the atrium. This could be a result of an atrial septal defect (ASD) or a patent foramen ovale (PFO).
ASDs make up 30% of congenital heart disease detected in adults. The female to male ratio is 2:1 and 75% of ASDs are ostia secunda. Treatment is with closure (either surgically or percutaneously) if the shunt is >1.5:1.
PFOs are relatively common in young people. Autopsy studies have shown a prevalence of up to 30%. Opinions are divided on whether they represent an increased risk of stroke secondary to a paradoxical embolus. They are also thought to be associated with development of migraine in some patients.

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A 78-year-old man attends the emergency department complaining of palpitations. He describes these as fast and regular of sudden onset and termination. He describes a particularly bad episode when he almost lost consciousness. He knows he is on warfarin 'to thin the blood' but unsure about the rest of his medications. He says that in the past he has been suffering from an irregular heartbeat, and that he recently was prescribed a course of antibiotics for a chest infection. He is allergic to penicillin, smokes 10 a day and drinks very occasionally. He denies any recent alcohol binges.
On examination he appears comfortable with a heart rate of 85 beats/min and a blood pressure of 144/89 mmHg. His heart sounds are normal and his chest is clear.
A 12-lead electrocardiogram (ECG) shows sinus rhythm with normal QRS complexes. The PR interval is 0.16 s and the QTc interval is 0.52 s.

His blood tests show:

Hb	14.1 g/dl
WCC	9.6×10^9/l
Platelets	253×10^9/l
Na^+	138 mmol/l
K^+	4.2 mmol/l
Urea	4.7 mmol/l
Creatinine	103 mol/l
TSH	3 mU/l

Which one of the following is most likely to account for the ECG findings in this case?

A	Amoxicillin treatment
B	Ciprofloxacin treatment
C	Doxycycline treatment
D	Erythromycin treatment
E	Cephalexin treatment

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Calculator

Normal Values

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Explanation

This gentleman has a long QT interval and he is at risk of atypical ventricular tachycardia (VT) (torsades de pointes). Although there are some rare congenital causes of long QT syndrome these are unlikely to present so late in life. It is more likely that this is iatrogenic in origin. Out of the antibiotics described, erythromycin is recognised to result in long-QT syndrome. Other drugs causing a long QT include antiarrhythmics (amiodarone, procainamide, disopyramide, quinidine, sotolol and bretylium), psychotropics (phenothiazines, tricyclic antidepressants, lithium, haloperidol), quinine, tacrolimus and cisapride.

32280

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Responses Total:	119
Responses - % Correct:	0%

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A 74-year-old hypertensive man is referred by his general practitioner (GP) to the cardiology department with a diastolic murmur that was picked up incidentally during one of his regular reviews. He denies any symptoms of angina, shortness of breath or palpitations. He is on bendrofluazide and ramipril for his hypertension, but no other medications. There is no past medical history of note.
On examination he is comfortable at rest with a blood pressure of 155/65 mmHg and a heart rate of 85 beats/min. He has a heaving precordium on palpation and there is a diastolic murmur at the left sternal edge which is present for half of diastole.
His electrocardiogram (ECG) shows sinus rhythm with left ventricular hypertrophy (LVH).

An echocardiogram shows a dimensionally normal left ventricle with good function. There is moderate aortic regurgitation and no other significant valve pathology.

Which one of the following should form part of this patient's management?

A	Coronary angiography
B	Annual echocardiographic follow-up
C	Beta-blocker therapy
D	Antibiotic prophylaxis advice
E	Outpatient 24 h ECG

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Normal Values

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C	Beta-blocker therapy
D	Antibiotic prophylaxis advice
E	Outpatient 24 h ECG

Explanation

B Annual echocardiographic follow-up

This patient has asymptomatic moderate aortic regurgitation (AR) with no signs of left ventricular failure, and therefore does not have any indications for surgery at this time. Patients with AR require regular echocardiographic follow-up to assess the state of the left ventricle, as symptoms develop quite late in the course of the disease. Elective valve replacement is indicated in patients who develop limiting symptoms, and in asymptomatic patients with evidence of progressive LV dilatation on echocardiography. Emergency valve replacement should be considered in patients with severe acute AR usually due to endocarditis.

A Coronary angiography

In the context of valvular disease, coronary angiography is indicated for the detection of associated coronary artery disease when surgery is planned. It may not be indicated before surgery in young patients with no atherosclerotic risk factors, or in rare circumstances when the risk of doing coronary angiography outweighs benefit. This patient has asymptomatic moderate aortic regurgitation (AR) with no signs of left ventricular failure, and therefore surgery is not indicated at this time. Coronary angiography would, therefore, not be appropriate.

C Beta-blocker therapy

This patient has asymptomatic moderate aortic regurgitation (AR) with no signs of left ventricular failure. Beta-blockade may significantly impact cardiac function, and so angiotensin-converting enzyme (ACE) inhibitors are preferable, as there is some evidence to suggest that these prevent left ventricular (LV) dilatation in the longer term.

D Antibiotic prophylaxis advice

Patients with acquired valvular heart disease are at increased risk of developing infective endocarditis (IE) and, previously, these patients were given antibiotic prophylaxis before dental and certain non-dental procedures, such procedures involving the upper and lower gastrointestinal tract. However, antibiotic prophylaxis is no longer recommended by NICE, and therefore advice on antibiotic prophylaxis would not be appropriate. However, advice on good oral hygiene and the symptoms that may indicate infective endocarditis would be.

E Outpatient 24 h ECG

This patient has asymptomatic moderate aortic regurgitation (AR) with no signs of left ventricular failure. An outpatient 24 h ECG is not indicated in this patient. However, an ECG would have been carried out, initially, alongside a clinical examination of the patient.

32281

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Responses Total:	120
Responses - % Correct:	0%

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A 48-year-old male presents with general malaise and ankle swelling. On close questioning he describes a decrease in his exercise tolerance over the last few months because of increasing breathlessness. He also describes a cough that is productive of clear sputum. There is no history of chest pains. He has no past medical history of note. He works as a financial consultant in a city firm. He smokes 10 cigarettes a day and drinks 40 units of alcohol per week.

On examination he is comfortable at rest, with a blood pressure of 155/98 mmHg and a heart rate of 90 beats/min regular. His jugular venous pressure (JVP) is raised and there is bipedal oedema. There is a pan-systolic murmur on auscultation of his heart and bi-basal crackles on auscultation of his chest.
His chest X-ray shows an enlarged heart with evidence of fluid overload.

His electrocardiogram (ECG) shows borderline left bundle branch block.

Investigations:

Hb	16.1 g/dl
WCC	6.6×10^9/l
PLT	273×10^9/l
Na^+	137 mmol/l
K^+	4.8 mmol/l
Creatinine	89 mol/l
MCV	98 fl
Urea	6.0 mmol/l
TSH	3 mU/l
Albumin	36 g/l
ALT	30 IU/l
AST	65 IU/l
GGT	100 IU/l

An echocardiogram shows a dilated left ventricle, with moderate global impairment of function and an ejection fraction of 40%. There is mild to moderate mitral regurgitation which is deemed to be functional.

Which of the following would be of most value impacting on his long term prognosis?

A	Viral serology
B	Beta-blocker therapy
C	Angiotensin converting enzyme inhibitor therapy
D	Alcohol cessation
E	Diuretic therapy

32282

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Calculator

Normal Values

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A 48-year-old male presents with general malaise and ankle swelling. On close questioning he describes a decrease in his exercise tolerance over the last few months because of increasing breathlessness. He also describes a cough that is productive of clear sputum. There is no history of chest pains. He has no past medical history of note. He works as a financial consultant in a city firm. He smokes 10 cigarettes a day and drinks 40 units of alcohol per week.

On examination he is comfortable at rest, with a blood pressure of 155/98 mmHg and a heart rate of 90 beats/min regular. His jugular venous pressure (JVP) is raised and there is bipedal oedema. There is a pan-systolic murmur on auscultation of his heart and bi-basal crackles on auscultation of his chest.
His chest X-ray shows an enlarged heart with evidence of fluid overload.

His electrocardiogram (ECG) shows borderline left bundle branch block.

Investigations:

Hb	16.1 g/dl
WCC	6.6 × 10^9/l
PLT	273 × 10^9/l
Na^+	137 mmol/l
K^+	4.8 mmol/l
Creatinine	89 mol/l
MCV	98 fl
Urea	6.0 mmol/l
TSH	3 mU/l
Albumin	36 g/l
ALT	30 IU/l
AST	65 IU/l
GGT	100 IU/l

An echocardiogram shows a dilated left ventricle, with moderate global impairment of function and an ejection fraction of 40%. There is mild to moderate mitral regurgitation which is deemed to be functional.

Which of the following would be of most value impacting on his long term prognosis?

A Viral serology

B Beta-blocker therapy

C Angiotensin converting enzyme inhibitor therapy

D Alcohol cessation

E Diuretic therapy

Explanation

D Alcohol cessation

This patient has symptoms and signs of heart failure and the most likely cause in this case is one of dilated cardiomyopathy secondary to alcohol abuse. Abstinence from alcohol is paramount in arresting the progress of the condition, and if he doesn't stop drinking, despite receiving medication for heart failure, he will continue to experience significant symptoms.

A Viral serology

This patient has symptoms and signs of heart failure and the most likely cause in this case is dilated cardiomyopathy secondary to alcohol abuse. Viral serology has a very low diagnostic yield and would not affect the advice to discontinue with alcohol consumption.

B Beta-blocker therapy

This patient has symptoms and signs of heart failure and the most likely cause in this case is dilated cardiomyopathy secondary to alcohol abuse. Beta-blockers reduce mortality and morbidity in symptomatic heart failure and should be started alongside an angiotensin-converting enzyme (ACE) inhibitor. However, given the aetiology, if he doesn't stop drinking he will continue to experience significant symptoms, and therefore this is not the most appropriate answer.

C Angiotensin converting enzyme inhibitor therapy

This patient has symptoms and signs of heart failure. The most likely cause in this case is one of dilated cardiomyopathy secondary to alcohol abuse. Angiotensin-converting enzyme (ACE) inhibitors reduce mortality and morbidity in heart failure and are therefore recommended in patients, unless contraindicated or not tolerated. However, given the aetiology, if he doesn't stop drinking he will continue to experience significant symptoms, and therefore this is not the most appropriate answer.

E Diuretic therapy

This patient has symptoms and signs of heart failure and the most likely cause in this case is one of dilated cardiomyopathy secondary to alcohol abuse. Diuretics are recommended to reduce the signs and symptoms of congestion, but their effect on mortality and morbidity have not been studied in RCTs. This is, therefore, not the most appropriate answer. If he doesn't stop drinking, despite receiving medication, he will continue to experience significant symptoms.

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A 65-year-old Jamaican lady is referred to the cardiology department by her GP with a history of progressive breathlessness. She has also noticed that her ankles have been swelling up recently. A trial of furosemide 40 mg once daily by her general practitioner (GP) has not produced any noticeable results.
On examination in the clinic she is found to have a blood pressure of 138/95 mmHg with a heart rate of 85 beats/min. Her jugular venous pressure is elevated and there is a third heart sound on auscultation. There is pedal oedema bilaterally. Her chest X-ray shows bilateral hilar lymphadenopathy with a normal-sized heart. An echocardiogram is performed that shows biatrial enlargement with normal-sized ventricles and preserved left ventricular systolic function.

Which of the following investigations would be most appropriate next step in establishing the diagnosis?

A	Computerised tomography (CT) of the chest
B	Serum angiotensin-converting enzyme (ACE)
C	Rectal biopsy
D	Liver biopsy
E	Immunoglobulin electrophoresis

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D	Liver biopsy
E	Immunoglobulin electrophoresis

Explanation

A Computerised tomography (CT) of the chest

This patient presents with symptoms of heart failure with preserved systolic function of the heart. This raises the possibility of restrictive cardiomyopathy leading to diastolic dysfunction. Causes of restrictive cardiomyopathy include infiltrative disease, such as amyloidosis, haemochromatosis and sarcoidosis, and post-radiation therapy fibrosis.

In the presence of hilar lympadenopathy in a Jamaican lady, sarcoidosis is a possible underlying cause. The true incidence of cardiac involvement in sarcoidosis is unknown. Infiltrating granulomas may occur in the heart of up to 50% of patients with systemic sarcoidosis, but clinical manifestations of cardiac involvement are thought to occur in 5%. Cardiac involvement in sarcoidosis is not always associated with widespread disease but when present it indicates a poor prognosis.

A liver biopsy may be undertaken if the diagnosis of haemochromatosis is suspected. Given that in this case, sarcoidosis is a more likely diagnosis, a CT of the chest is the preferred next diagnostic step.

B Serum angiotensin-converting enzyme (ACE)

This patient presents with symptoms of heart failure with preserved systolic function of the heart. This raises the possibility of restrictive cardiomyopathy leading to diastolic dysfunction. Causes of restrictive cardiomyopathy include infiltrative disease, such as amyloidosis, haemochromatosis and sarcoidosis, and post radiation therapy fibrosis.

C Rectal biopsy

This patient presents with symptoms of heart failure with preserved systolic function of the heart. This raises the possibility of restrictive cardiomyopathy leading to diastolic dysfunction. Secondary causes of restrictive cardiomyopathy include infiltrative disease, such as amyloidosis, haemochromatosis and sarcoidosis, and post-radiation therapy fibrosis.

D Liver biopsy

This patient presents with symptoms of heart failure with preserved systolic function of the heart. This raises the possibility of restrictive cardiomyopathy leading to diastolic dysfunction. Secondary causes of restrictive cardiomyopathy include infiltrative disease, such as amyloidosis, haemochromatosis and sarcoidosis, and post-radiation therapy fibrosis.

E Immunoglobulin electrophoresis

This patient presents with symptoms of heart failure with preserved systolic function of the heart. This raises the possibility of restrictive cardiomyopathy leading to diastolic dysfunction. Secondary causes of restrictive cardiomyopathy include infiltrative disease, such as amyloidosis, haemochromatosis and sarcoidosis, and post-radiation therapy fibrosis.

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A 64-year-old woman is referred by her general practitioner for review. She has felt 'washed-out' over the past few weeks and has suffered a number of fevers and chills. There is a past medical history of Sydenham's chorea and a dental extraction was carried out around 2 months ago. Examination reveals the murmur of mitral regurgitation. She has peripheral splinter haemorrhages. Blood cultures are taken.

Blood testing reveals:

Hb	9.0 g/l
MCV	92.0 fl
WCC	12.5×10^9/l
neutrophils	10.5×10^9/l
Platelets	190×10^9/l
ESR	95 mm/hr

Which one of the following stems represents the best choice for initial management?

A	Commence IV steroids
B	Commence IV penicillin and gentamicin
C	Check autoimmune profile
D	Arrange endoscopy to investigate anaemia
E	Commence ferrous sulphate

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D	Arrange endoscopy to investigate anaemia
E	Commence ferrous sulphate

Explanation

This patient has a history of Sydenham's chorea, a condition associated with rheumatic fever, and a recent history of dental extraction. It is likely that there has been some long-standing damage as a result of the rheumatic fever, and that the dental extraction has introduced infection resulting in endocarditis. The history of fever and malaise, normochromic, normocytic anaemia and markedly raised erythrocyte sedimentation rate (ESR) associated with the murmur of mitral regurgitation and splinter haemorrhages (signifying immune complex deposition) points towards a diagnosis of endocarditis. The key to establishing a microbiological diagnosis is the taking of multiple sets of blood cultures from multiple sites. Empirical antibiotic therapy should be started as soon as possible, even before echocardiography if there is any delay in obtaining an echo, in the face of such strong evidence pointing to the diagnosis. The most likely infective agent in this case would be Streptococcus viridans.

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A 32-year-old man is admitted from King's Cross Station after a cardiac arrest. One of the station staff used an automatic defibrillator and shocked him from ventricular fibrillation into sinus rhythm. He denies chest pain prior to the event, has an unremarkable past medical history and documented normal glucose, blood pressure and cholesterol at his GP surgery. He is a non-smoker. On examination in casualty he is GCS (Glasgow Coma Scale) 13, blood pressure is 120/80 mmHg and he is now in sinus rhythm. The electrocardiogram reveals right bundle-branch block and ST elevation in the right precordial leads.

Which one of the following would be the most appropriate treatment option in this case?

A	Amiodarone
B	Verapamil
C	An implantable defibrillator
D	Warfarinisation
E	Atenolol

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Normal Values

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A	Amiodarone
B	Verapamil
C	An implantable defibrillator
D	Warfarinisation
E	Atenolol

Explanation

Right bundle-branch block and ST elevation in the right precordial leads associated with ventricular fibrillation and sudden death is characteristic of the Brugada syndrome. Prognosis of patients is related to history of previous syncope and inducibility of arrhythmias during ventricular stimulation. An implantable defibrillator is the treatment of choice in these patients, although a sub-set of patients may also be considered for therapy with quinidine, particularly those who present with "VF storm", with multiple firings of their defibrillator in one day. Other anti-arrhythmics such as amiodarone and verapamil are not effective in managing the condition.

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A 62-year-old woman is admitted as an emergency suffering from extreme headache, nausea, vomiting and increasing drowsiness. Her blood pressure on admission is 185/130 mmHg and she has grade IV hypertensive retinopathy. Electrolyte testing reveals potassium 3.8 mmol/l, sodium 134 mmol/l and creatinine 158 mmol/l, and you admit her to the HDU.

Which one of the following stems represent the best management for this patient?

A	Intravenous sodium nitroprusside
B	Oral atenolol
C	Oral amlodipine
D	Oral ramipril
E	Oral furosemide

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B	Oral atenolol
C	Oral amlodipine
D	Oral ramipril
E	Oral furosemide

Explanation

This patient has hypertensive encephalopathy with a deteriorating level of consciousness. Her condition is too severe for oral therapy and she requires intravenous (iv) blood pressure lowering therapy with sodium nitroprusside. The aim of treatment is to lower blood pressure to around 110–115 mmHg diastolic within 2–4 h. Nitroprusside therapy may be accompanied by iv furosemide. Where there is significant neurology, CT is also an important part of the workup. Acute blood pressure lowering may result in an extension of deficit in the event of a proven stroke. Late features of hypertensive encephalopathy may include fits and coma.

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A 62-year-old heavy smoker presents to the emergency department with a history of very severe central chest pain radiating to the back. Past medical history of note includes hypertension controlled with ramipril and atenolol, and a transient ischaemic attack some 6 months earlier. Examination reveals a difference in blood pressure of 35/10 mmHg between the two arms. There are signs of aortic regurgitation and a pericardial friction rub. The electrocardiogram reveals evidence of inferior ST elevation and atrial fibrillation with a ventricular rate of 90/min. His BP is 125/75 mmHg.

Which one of the following options represents optimal management of this case?

A	Intravenous thrombolysis
B	Beta-blockade
C	Intravenous heparin therapy
D	Aspirin
E	ACE inhibition

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C	Intravenous heparin therapy
D	Aspirin
E	ACE inhibition

Explanation

The clinical signs in this patient point towards a diagnosis of aortic dissection. It is likely that the electrocardiogram signs of inferior myocardial infarction are due to the dissection having compromised the right coronary artery osteum. Key management considerations are reduction of blood pressure (with intavenous b-blockade) and pain relief. Contrast computed tomography (CT) scanning is necessary to assess the extent of dissection and suitability for surgery, and early consultation with a cardiothoracic surgeon is advised. Mortality for untreated aortic dissection is 25–30% at 24 h and 65–70% at 2 weeks; dissections confined to the descending aorta are associated with better survival (80%).

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A 23-year-old male presents with a history of palpitations of 3 years' duration. He describes them as forceful contractions that he can hear very loudly and at times he feels as if he had skipped beats. These feelings occur more often when he is under stress and sometimes are associated with feeling of inability to get enough breath into his lungs. One week ago he had an attack of palpitations at his university lasting for 10 min and associated with shaking, sweating, chest pain, shortness of breath, feeling of being choked and light-headedness. His father died of a heart attack at the age of 55 years, and two of his uncles have permanent pacemakers implanted for sick sinus syndrome. Physical examination reveals a lean and tall young male with heart rate of 68/min, blood pressure 115/70 mmHg and respiratory rate of 14/min. He has high arched palate, normal jugular venous pulse, normal heart sounds and clear lung fields.

An electrocardiogram (ECG) tracing is obtained and is shown below.



What is the rhythm disturbance shown in this tracing?

A	Sinus pause
B	Sinus arrest
C	Sinus exit block
D	Sick sinus syndrome
E	Sinus arrhythmia

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A	Sinus pause
B	Sinus arrest
C	Sinus exit block
D	Sick sinus syndrome
E	Sinus arrhythmia

Explanation

The answer is Sinus arrhythmia -

The electrocardiogram (ECG) tracing shows normal P wave, PR interval, QRS complex and each P wave conducted to ventricles. There is a gradual decrease in R-R interval and then an increase again. This slight beat-to-beat variation is termed as sinus arrhythmia, and the most common cause is respiration. Respiratory sinus arrhythmia is thus heart rate variability in synchrony with respiration, and is normal in children and young adults. The R-R interval decreases with inspiration and increases with expiration. The episode of palpitations in this patient is suggestive of anxiety. Hence he should be reassured. In sinus arrest, sinoatrial exit block or sinus pause, the R-R interval does not have a rhythmic and cyclical variation; rather there is unexpected disappearance of the P wave for a variable interval. This can occur in Wenkebach-type fashion, or the pause may be multiple of basic sinus rhythm.

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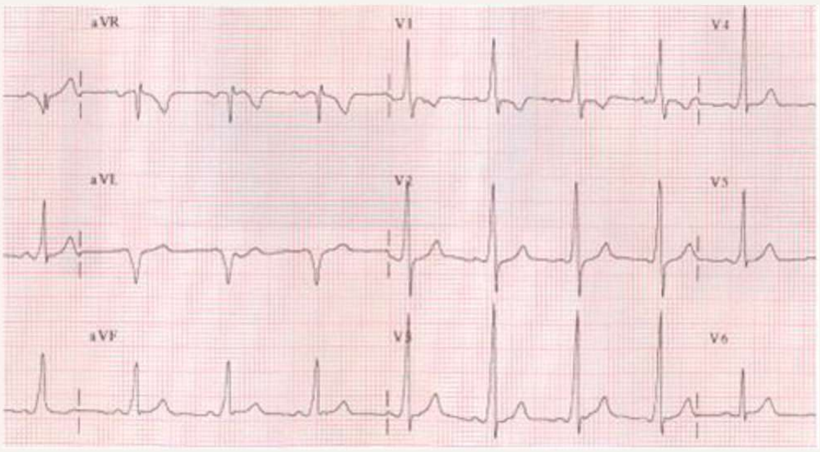
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A 16-year-old female presents with a history of palpitations of 1 year's duration. The palpitations are felt as a very rapid pounding of the heart and are associated with light-headedness. The episodes usually last for few minutes. However, on the day of presentation she had a syncopal attack. Physical examination reveals thin young female with heart rate of 70/min, blood pressure 120/88 mmHg and respiratory rate of 16/min. Both heart sounds are normal, jugular venous pulsations are normal and the chest is clear to auscultation.

A 12-lead electrocardiogram (ECG) is taken and is shown below.



What is the most likely diagnosis?

A	Brugada syndrome
B	Wolff–Parkinson–White (WPW) syndrome type A
C	WPW type B
D	Right bundle branch block
E	Arrhythmogenic right ventricular dysplasia

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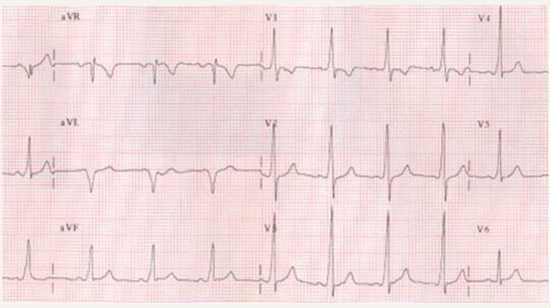
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D	Right bundle branch block
E	Arrhythmogenic right ventricular dysplasia

Explanation

The electrocardiogram (ECG) shows a short PR interval and a delta wave, best seen in leads aVF and V4. A dominant R wave in lead V1 is consistent with diagnosis of Wolff–Parkinson–White (WPW) syndrome type A, in Type B a predominantly negative delta wave is seen in V1. Other causes of tall R wave in V1 include posterior myocardial infarction, right bundle branch block and dextrocardia; however, in all of these cases PR interval is normal and delta wave is not seen. This patient has frequent palpitations and a syncopal event; therefore she should undergo electrophysiological studies and possible radiofrequency ablation of the accessory pathway if one is identified. This procedure has a high success rate and low incidence of complications and is considered by most to be preferable to a long-term commitment to anti-arrhythmic therapy.

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A 69-year-old male presents with history of recurrent episodes of substernal chest pain of 2 days' duration. The pain is dull and aching in nature with no radiation and no associated symptoms. It is brought on by exertion and relieved by rest. His last episode has been present for 1 h. Physical examination reveals a pulse rate of 68/min, blood pressure 145/90 mmHg and respiratory rate 14/min. There is an ejection systolic murmur at the aortic, but the carotid upstroke is well preserved. The rest of the physical examination is normal.

Investigations show:

Chest X-ray	Normal
Electrocardiogram (ECG)	Left ventricular hypertrophy and ST depression in leads II, III and aVF
White cell count	10×10^9/l
Haemoglobin	14 g/dl
Platelets	490×10^9/l
Troponin T	1.8 ng/ml
Urea and electrolytes	Normal

The patient is treated with aspirin, clopidogrel, atenolol, intravenous heparin and nitroglycerine. On the second day of admission the patient develops light-headedness and hypotension. ECG tracing reveals complete heart block. The patient is treated with a temporary transvenous pacemaker, followed by placement of a permanent pacemaker. He does well and is discharged home by 6th day. He presents the next day again with history of pain and swelling in his left upper extremity. His physical examination and ECG is unchanged from the day of discharge except for oedema of left upper limb.

Investigations reveal:

White cell count	13.2×10^9/l
Haemoglobin	13.8 g/dl
Platelets	210×10^9/l
Doppler of left subclavian vein	Thrombosis along the pacemaker wire

What one of the following is the most appropriate way to anticoagulate this patient?

A	Start heparin infusion
B	Start warfarin
C	Start low-molecular weight heparin
D	Increase aspirin dose
E	Start hirudin

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C	Start low-molecular weight heparin
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E	Start hirudin

Explanation

This patient has a more than 50% drop in his platelet count (from 490 to 210 × 109/l) after exposure to heparin. He also has thrombosis of the left subclavian vein. This clinical picture suggests heparin-induced thrombocytopenia (HIT). Antiheparin-platelet factor 4 antibody screening is the confirmatory test for HIT. HIT is a prothrombotic state and these patients should receive anticoagulant. Hirudin is a direct thrombin inhibitor that is approved for treatment of patients with HIT. Other direct thrombin inhibitors include bivalirudin and argatroban. HIT is much less common with the use of low molecular weight heparin and as such is seen more infrequently in modern hospital practice.

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A 58-year-old man is brought into the accident and emergency department of your University Hospital with a 2 h history of central crushing chest pain associated with weakness and diaphoresis. He has a no history of ischaemic heart disease but had a left carotid endarterectomy 10 months ago after an ischaemic stroke from which he has almost fully recovered. He smokes 20 cigarettes/day. The patient was administered oxygen, aspirin and sublingual nitroglycerine (GTN) spray in the ambulance but has persistent pain. On examination he has a pulse rate of 120/min, blood pressure is 140/90 mmHg. Examination of the chest does not reveal any abnormality. His O_2 saturation is measured at 93%. A 12-lead electrocardiogram (ECG) reveals sinus tachycardia and ST-segment elevation suggestive of ischaemia in leads 1, aVL, V5 and V6. There is no history of haemorrhagic stroke, active internal bleeding, suspected aortic dissection, active peptic ulcer disease, major surgery within the past 3 weeks or recent trauma. It is now 3 h since the onset of symptoms. You plan to take him to the cardiac catheter lab for angioplasty. He has been treated with IV heparin and morphine and given aspirin by the paramedic crew.

Which one of the following treatments is most important with respect to prognosis, whilst awaiting transfer to the lab?

A	Reperfusion therapy with thrombolytic agent
B	Intravenous ß-blocker
C	Angiotensin-converting enzyme (ACE) inhibitor
D	Clopidogrel
E	Intravenous nitrate

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A 58-year-old man is brought into the accident and emergency department of your University Hospital with a 2 h history of central crushing chest pain associated with weakness and diaphoresis. He has a no history of ischaemic heart disease but had a left carotid endarterectomy 10 months ago after an ischaemic stroke from which he has almost fully recovered. He smokes 20 cigarettes/day. The patient was administered oxygen, aspirin and sublingual nitroglycerine (GTN) spray in the ambulance but has persistent pain. On examination he has a pulse rate of 120/min, blood pressure is 140/90 mmHg. Examination of the chest does not reveal any abnormality. His O_2 saturation is measured at 93%. A 12-lead electrocardiogram (ECG) reveals sinus tachycardia and ST-segment elevation suggestive of ischaemia in leads 1, aVL, V5 and V6. There is no history of haemorrhagic stroke, active internal bleeding, suspected aortic dissection, active peptic ulcer disease, major surgery within the past 3 weeks or recent trauma. It is now 3 h since the onset of symptoms. You plan to take him to the cardiac catheter lab for angioplasty. He has been treated with IV heparin and morphine and given aspirin by the paramedic crew.

Which one of the following treatments is most important with respect to prognosis, whilst awaiting transfer to the lab?

A	Reperfusion therapy with thrombolytic agent
B	Intravenous ß-blocker
C	Angiotensin-converting enzyme (ACE) inhibitor
D	Clopidogrel
E	Intravenous nitrate

Explanation

All patients with chest pain suggestive of ischaemia and below normal O_2 saturations should be treated immediately with oxygen at 4 l/min, aspirin and sublingual nitroglycerine (GTN) spray. Morphine 2–4 mg intravenous should be administered if the pain is not relieved by GTN spray provided that the patient is not hypotensive. ACE inhibitors are not given during the first 6 h following acute myocardial infarct because of potential haemodynamic instability. Guidance suggests that bivalrudin combined with pre-treatment with clopidogrel appears to be the optimal pre-PCI strategy. Beta-blockers are indicated in the management of acute MI provided there is no bradycardia, hypotension or left ventricular failure although they are of lesser importance versus clopidogrel. PCI is now preferred to thrombolysis, and rescue angioplasty after thrombolysis is much less successful; thrombolysis is therefore incorrect.

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A 55-year-old female presents with history of tiredness and decreased effort tolerance of three months' duration. She has 5 years' history of hypertension controlled on indapamide slow-release 1.5 mg/day. She is a lifelong non-smoker and has no family history of premature coronary artery disease. Her lipid profile checked six months earlier was normal. She has no other past medical history of note. Physical examination reveals an irregular pulse at rate of 95/min, blood pressure 135/80 mmHg, no jugular venous distension, apex beat in the 5th intercostal space, and normal heart sounds without any murmur.

Investigations:

Haemoglobin	14 g/dl
Serum potassium	4.4 mmol/l
Serum sodium	138 mmol/l
Serum creatinine	85 mol/l
Thyroid-stimulating hormone (TSH)	1.3 IU/l (0.4–5)
Free thyroxine (T4)	13pmol/l (10–22)
Electrocardiogram (ECG)	Atrial fibrillation with ventricular rate of 108/min
Echocardiography	Left ventricular (LV) ejection fraction 58%, left atrial diameter 4.2 cm, concentric LV hypertrophy and trivial mitral regurgitation

Which one of the following therapies should be instituted for this patient?

A	Aspirin 75 mg a day
B	Aspirin 100 mg a day
C	Warfarin with a target INR of 2-3
D	Clopidogrel 75 mg a day
E	Aspirin and dypridamole MR 150 mg/50 mg BD

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C Warfarin with a target INR of 2-3

D Clopidogrel 75 mg a day

E Aspirin and dypridamole MR 150 mg/50 mg BD

Explanation

C Warfarin with a target INR of 2-3

This patient has chronic AF with evidence of left atrial dilatation. As such she is at high risk of an embolic stroke, and anti-coagulation should be instituted to reduce the risk of this happening.

A Aspirin 75 mg a day

Aspirin 75 mg is appropriate as a primary prevention option for stroke, but not against a background of atrial fibrillation.

B Aspirin 100 mg a day

Aspirin 100 mg per day was the dose used in the 'aspirin for asymptomatic atherosclerosis' triallists study in 30,000 individuals. Any benefit didn't reach statistical significance, and the rate of serious GI bleeding was doubled.

D Clopidogrel 75 mg a day

This is used for secondary stroke prevention in the absence of atrial fibrillation.

E Aspirin and dypridamole MR 150 mg/50 mg BD

This is the oral option that was tested in the ESPS2 trial. It was formerly recommended for secondary prophylaxis against stroke, but has now been superseded in NICE guidelines by clopidogrel.

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A 55-year-old man presents to the Emergency Department with acute onset of crushing retrosternal chest pain that started 3 h ago and has become much worse in the last 30 min. Other than hypertension, he has no past medical history of note. He has a pulse of 40 beats/min, blood pressure (BP) of 104/63 mmHg, jugular venous pulsation is seen up to 3 cm above the sternal notch and the chest is clear to auscultation.
An electrocardiogram (ECG) shows narrow QRS complexes with 2 mm ST segment elevation in leads II, III and aVF, as well as complete heart block (CHB). He is given aspirin and clopidogrel.

Which of the following is the most appropriate way to manage this patient?

A	IV streptokinase
B	IV Reteplase
C	Temporary transcutaneous pacemaker
D	Temporary transvenous pacemaker
E	Urgent PCI

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D	Temporary transvenous pacemaker
E	Urgent PCI

Explanation

E	Urgent PCI

Conduction abnormalities are common in patients with inferior myocardial infarction (MI), as the right coronary artery (RCA) supplies the sinoatrial (SA) node (60% of people), atrioventricular (AV) node (90% of people) and His bundle. Complete heart block (CHB) in association with inferior MI is often associated with narrow complex escape rhythm, rarely progresses to asystole, and usually resolves within one week. If escape rhythm is more than 40 beats/min with normal blood pressure, treatment is not required. Urgent PCI is the best option, as reperfusion of the RCA is likely to restore AV node function.

A	IV streptokinase

IV streptokinase is of course now superseded by PCI and by TPA where PCI is not available or is inappropriate. It is still used in the treatment of complicated empyema, where any abscess might be multi-loculated.

B	IV Reteplase

TPA is only considered an option for patients where PCI is either inappropriate or unavailable.

C	Temporary transcutaneous pacemaker

Fondaparinux is the anticoagulant of choice for NSTEMI, which is ruled out by the inferior lead ST elevation seen here.

D	Temporary transvenous pacemaker

Given this patient's systolic blood pressure is above 100 mmHg and pulse is 40, there is no indication at this stage to introduce a temporary pacemaker. It's better to progress directly to PCI.

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A 48-year-old male is admitted to the coronary care unit post PCI, having had acute onset retrosternal chest pain some 2 h earlier. He is initially stable, with a pulse of 67 sinus rhythm and BP of 125/70. Six hours after arrival the nurse in charge calls you because his ECG monitor shows frequent premature ventricular contractions (PVCs). The patient is comfortably lying in the bed, and is asymptomatic: blood pressure (BP) 105/65 mmHg, pulse 69 beats/min, jugular venous pulse (JVP) is 2 cm above the sternal notch and the chest is clear to auscultation. As you examine him you notice frequent PVCs and a run of ventricular tachycardia (VT) lasting 5 s. The nurse tells you that he had a similar run of VT few minutes ago.

Which of the following steps is most appropriate at this stage?

A	IV lignocaine
B	IV Amiodarone
C	IV Procainamide
D	Observation
E	Check potassium and magnesium levels

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Explanation

E	Check potassium and magnesium levels

Premature ventricular contractions (PVCs) and non-sustained ventricular tachycardia (NSVT) are common in the early post-myocardial infarction (MI) period. NSVT is defined as three or more consecutive beats at a rate >100 beats/min that last less than 30 s. If these do not cause any haemodynamic compromise, treatment is not needed.

Hypokalaemia increases the incidence of NSVT as well as VT and ventricular fibrillation (VF), and hence it is prudent to check serum potassium (K^+) levels early. During the GISSI-2 trial it was observed that a serum K^+ level of <3.6 mmol/l was associated with a twofold increased risk of VF. Therefore serum K^+ should be maintained >4 mmol/l by oral or intravenous (IV) supplementation in patients with acute MI.

Concomitant magnesium (Mg^{2+}) deficiency is present in many patients with hypokalaemia and also makes correction of hypokalaemia difficult. Hence serum Mg^{2+} levels should also be checked and maintained >1 mmol/l.

A	IV lignocaine

Anti-arrhythmic therapy might be considered if NSVT causes haemodynamic compromise or becomes sustained VT. Lignocaine can be significantly negatively inotropic, and hence it isn't a first-choice option here.

B	IV Amiodarone

IV amiodarone is a first-choice antiarrhythmic, although the first step in this case is to check potassium and magnesium levels and correct them as needed.

C	IV Procainamide

It was thought that there was little practical difference between amiodarone and procainamide for the treatment of VT, although recent RCT evidence supports a superior efficacy profile for procainamide in the event that an anti-arrhythmic is required (see weblink below).

D	Observation

Hypokalaemia and hypomagnesaemia are both associated with significant risk of VF, and hence leaving levels unchecked is not an option.

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A 45-year-old male is admitted to the coronary care unit with a history of retrosternal chest pain of 1 h duration associated with sweating and nausea. His initial electrocardiogram (ECG) shows ST segment elevation in inferior leads. His blood pressure is 110/60 mmHg, pulse rate 60 beats/min and respiratory rate of 18/min. His chest and cardiac examination is unremarkable. He undergoes urgent PCI with angioplasty and stenting of the right coronary artery. After 3 h the blood pressure recorded is 85/55 mmHg and pulse rate is 88/min. He has low-volume peripheral pulses, jugular venous distension, normal first and second heart sounds and a pansystolic murmur best heard at the left sternal edge. The lung fields are clear to auscultation.

Which of the following is the most useful next investigation for this patient?

A	CT pulmonary angiogram
B	Ventilation/perfusion scan
C	Swan-Ganz catheterisation
D	Echocardiography
E	Repeat troponin

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A	CT pulmonary angiogram
B	Ventilation/perfusion scan
C	Swan-Ganz catheterisation
D	Echocardiography
E	Repeat troponin

Explanation

D	Echocardiography

Inferior wall myocardial infarction (MI) is associated in one third of cases with right ventricular myocardial infarction (RVMI). RVMI leads to reduced right ventricle compliance and stroke volume, which in turn leads to reduced left ventricle filling and low cardiac output. VSD or acute mitral regurgitation may lead to a pansystolic murmur, and an echocardiogram will inform most quickly as to the underlying diagnosis. The murmur is most likely to be a function of tricuspid regurgitation secondary to a hypokinetic dilated right ventricle. The most likely diagnosis here is acute tricuspid regurgitation due to right ventricular dilatation.

A	CT pulmonary angiogram

Pulmonary embolism (PE) can also have similar physical findings: jugular venous distension, hypotension and clear lung fields. A PE might be seen in the setting of an acute MI, but would be more usual during the recovery period, particularly when patients take a few days to mobilise.

B	Ventilation/perfusion scan

There is a very low probability of a PE occurring in the setting of an acute MI, and these symptoms are more likely to be due to a right ventricular infarct.

C	Swan-Ganz catheterisation

Swan-Ganz catheterisation may be useful in predicting requirements for fluid replacement and guiding any use of inotropes, although in the first instance an ECHO is more important to confirm the underlying diagnosis.

E	Repeat troponin

Troponin is still likely to be rising as a result of the original MI, and won't inform on management here.

Patients typically present with hypotension, jugular venous distension and clear lung fields in the setting of an inferior or inferoposterior MI, as is the case in this patient. These findings can mimic cardiac tamponade. An echocardiography will be useful in excluding tamponade and will also aid in diagnosis by demonstrating right ventricular dysfunction and dilatation. It has an added advantage of assessing left ventricular ejection fraction.

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A 58-year-old male presents with history of pain and swelling of his left calf of three days' duration. He denies any shortness of breath, fever or trauma, and has not had any joint pain previously. The only past medical history of note is diabetes mellitus of 6 years' duration. He does not have any obvious risk factors for venous thrombosis and has no family history of such disorder either. Physical examination is normal except for a swollen, warm left leg.

Investigations:

Hb	13.1 g/dl
WCC	27.4 × 10^9/l; 81% lymphocytes, small mature lymphocytes seen on film
PLT	193 × 10^9/l
PT	19.2 s (11.5–15.5)
PTT	23.9 s (24–35)
INR	1.1
Urea	Normal
Urine dipstick	SG 1.020, pH 6, Glucose +++
ECG	Normal
CXR	Normal
LDH	455 U/l (480–550)
Abdomen ultrasound	No intra-abdominal lymphadenopathy
Repeat complete blood count	WBC 34.3 × 10^9/l with 86% lymphocytes
Doppler ultrasound of lower limbs	Thrombosis of tibial and popliteal veins on the left

What one of the following is the most appropriate way to manage this patient's long-term anti-coagulation?

A	Warfarin for 6 months
B	Warfarin for 6 months
C	Low-molecular weight (LMW) heparin
D	Warfarin for 3 months
E	Dabigatran

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C Low-molecular weight (LMW) heparin

D Warfarin for 3 months

E Dabigatran

Explanation

C Low-molecular weight (LMW) heparin

This patient has a proximal DVT and potential underlying chronic lymphocytic leukaemia with increased risk of further venous thromboembolism. As such, long-term anti-coagulation is required. LMW heparin has the least potential for drug interaction or for its effect to be modulated by hepatic dysfunction (resulting from chemotherapy interventions), and is therefore the optimal choice here.

A Warfarin for 6 months

Warfarin has the potential for drug-drug interactions with a range of chemotherapy agents used in the treatment of haematological malignancy and thus should be avoided here.

B Warfarin for 6 months

Six months' anticoagulation is likely to be inadequate in the context of underlying CLL, and because of drug-drug interaction potential, and any effects on INR of hepatic dysfunction as result of therapy, it should be avoided here.

D Warfarin for 3 months

Three months' anticoagulation is inadequate in this situation and warfarin should be avoided here.

E Dabigatran

Although modern anticoagulants such as Factor Xa inhibitors could in theory be used in the context of underlying haematological malignancy, there isn't a substantial body of evidence to support a positive benefit risk in this population.

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A 68-year-old male presents with history of retrosternal chest pain that started suddenly 6 h ago, radiated to the left arm and lasted for 30 min. About 20 min ago the pain started again. He was diagnosed with hypercholesterolaemia 2 years earlier, and is taking atorvastatin 40 mg/day. On physical examination, his pulse rate is 52/min, blood pressure is 95/55 mmHg and respiratory rate is 22/min. There is no jugular venous distension, heart sounds are normal and his chest is clear to auscultation. Electrocardiogram (ECG) reveals 1.5 mm ST segment depression in lateral leads. The patient is administered chewable aspirin 300 mg, sublingual nitroglycerine, morphine and fondaparinux. Hs-troponin is significantly elevated.

Which additional medication should be administered to this patient?

A	Atenolol
B	Clopidogrel
C	Streptokinase
D	Abciximab
E	Dopamine

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A	Atenolol
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D	Abciximab
E	Dopamine

Explanation

B	Clopidogrel

This patient has non-ST segment elevation myocardial infarction (NSTEMI). Pharmacotherapy for NSTEMI includes antiplatelet therapy in the form of aspirin and clopidogrel, fondaparinux and other agents such as beta-blockers, GTN and angiotensin-converting enzyme inhibitors. However, beta-blockade, nitrates and ACE inhibitors are contraindicated if there is significant hypotension.

A	Atenolol

Although introducing atenolol is associated with positive CV outcomes post MI, in this situation with hypotension and relative bradycardia it may lead to significant cardiovascular instability.

C	Streptokinase

Thrombolysis isn't indicated in the treatment of NSTEMI; in STEMI, PCI is the preferred intervention.

D	Abciximab

Abciximab is a IIbIIIa platelet inhibitor, and is usually considered in patients with a STEMI where PCI is planned.

E	Dopamine

Dobutamine is an inotrope. Inotropes are used with caution in the acute MI setting because of the risk that they may actually worsen myocardial ischaemia with only a limited effect on blood pressure.

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A 68-year-old male is admitted to hospital with acute onset of substernal chest pain; an electrocardiogram (ECG) reveals acute inferior myocardial infarction. He undergoes primary angioplasty and stenting to the right coronary artery and makes an uneventful recovery. He is discharged home on aspirin 75 mg/day, atenolol 50 mg/day, pravastatin 20 mg/day, enalapril 10 mg twice daily and clopidogrel 75 mg/day. He presents two weeks later again with substernal chest pain. The pain is sharp, radiates to the left trapezius ridge and left lower chest and increases with respiration. On physical examination his pulse rate is 75/min, blood pressure 110/60 mmHg, respiratory rate 22/min and temperature 38.5°C. There is no jugular venous distension, heart sounds are normal and a friction rub is heard at the left anterior and posterior chest. Chest X-ray reveals cardiomegaly, small left pleural effusion and few infiltrates at the left lower zone.

Further investigations:

Hb	13.8 g/dl
WCC	15×10^9/l
PLT	187×10^9/l
ESR	55 mm/1st h
Troponin	<0.05
Urea & other electrolytes	Normal

Which one of the following is the most appropriate way to treat this patient?

A	IV antibiotics
B	Aspirin 650 mg QDS
C	Prednisolone 60 mg/day
D	S/c low-molecular weight (LMW) heparin
E	Indometacin 100 mg BD

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E	Indometacin 100 mg BD

Explanation

B Aspirin 650 mg QDS

This patient's clinical presentation is suggestive of Dressler syndrome, which usually occurs 1-8 weeks after myocardial infarction. Patients present with malaise, fever, pericardial pain, elevated ESR and sometimes may also have pleuritis and pneumonitis. It has been postulated that the syndrome results from release of cardiac antigens which then stimulate antibody production. The immune complexes are then deposited in the pericardium, pleura and lung. There may be accompanying pleural and pericardial effusion and therefore echocardiography should be done.

A IV antibiotics

This patient has inflammatory rather than infective pericarditis, and thus antibiotics have no role in its management.

C Prednisolone 60 mg/day

Corticosteroids are not recommended in the treatment of Dressler syndrome because of the risk that they may delay myocardial healing.

D S/c low-molecular weight (LMW) heparin

The friction rub on auscultation is more consistent with pericarditis versus a pulmonary embolus, and thus LMW heparin is not required.

E Indometacin 100 mg BD

Other NSAIDs such as indomethacin may be utilised in the event that aspirin isn't tolerated.

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External Links

Pericardial Diseases (Guidelines on the Diagnosis and Management of)
escardio.org/Guidelines-&-Education/Clinical-Practice-Guidelines/Pericardial-Disease...

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A 28-year-old male presents with two days' history of high-grade fever. He has no other symptoms. He has had insulin-dependent diabetes mellitus for the last 10 years which is well controlled on twice daily intermediate-acting insulin. Physical examination reveals a sick-looking young male with a temperature of 39.5°C, blood pressure 150/70 mmHg, pulse rate 98/min and respiratory rate of 22/min. Examination of the skin, chest, abdomen, cardiovascular and central nervous system is non-contributory.

Investigations:

Hb	13.1 g/dl
WCC	14 × 10^9/l
PLT	452 × 10^9/l
Na+	132 mmol/l (135-145)
K+	4.1 mmol/l (3.5-5.0)
Creatinine	100 mol/l (18-106)
Chloride	92 mmol/l (97–110 mmol/l)
Bicarbonate	26 mmol/l (22–28mmol/l)
Urine dipstick	Normal
Urine dipstick	Normal
ECG	Normal
CXR	Normal
Blood culture	Preliminary report shows Gram-positive cocci in clusters in both aerobic and anaerobic bottles

Which of the following is the investigation most likely to confirm the diagnosis in this patient?

A	Upper GI endoscopy
B	Lumbar puncture
C	Abdominal ultrasound scan
D	CT abdomen
E	Trans-oesophageal echocardiogram (TOE)

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A 28-year-old male presents with two days' history of high-grade fever. He has no other symptoms. He has had insulin-dependent diabetes mellitus for the last 10 years which is well controlled on twice daily intermediate-acting insulin. Physical examination reveals a sick-looking young male with a temperature of 39.5°C, blood pressure 150/70 mmHg, pulse rate 98/min and respiratory rate of 22/min. Examination of the skin, chest, abdomen, cardiovascular and central nervous system is non-contributory.

Investigations:

Hb	13.1 g/dl
WCC	14×10^9/l
PLT	452×10^9/l
Na+	132 mmol/l (135-145)
K+	4.1 mmol/l (3.5-5.0)
Creatinine	100 mol/l (18-106)
Chloride	92 mmol/l (97–110 mmol/l)
Bicarbonate	26 mmol/l (22–28mmol/l)
Urine dipstick	Normal
Urine dipstick	Normal
ECG	Normal
CXR	Normal
Blood culture	Preliminary report shows Gram-positive cocci in clusters in both aerobic and anaerobic bottles

Which of the following is the investigation most likely to confirm the diagnosis in this patient?

A	Upper GI endoscopy
B	Lumbar puncture
C	Abdominal ultrasound scan
D	CT abdomen
E	Trans-oesophageal echocardiogram (TOE)

Explanation

E Trans-oesophageal echocardiogram (TOE)

This patient has community-acquired staphylococcal bacteraemia. Up to 20% of these patients may have infective endocarditis without any clinical stigmata of infective endocarditis. TOE is more sensitive than transthoracic (TTE), is widely available and is the investigation of choice versus TTE in those patients who are able to tolerate the procedure. The antimicrobial therapy of choice is IV flucloxacillin coupled with IV gentamicin, unless the isolate is found to be methicillin resistant.

A Upper GI endoscopy

Streptococcus gallolyticus is a cause of endocarditis in patients with underlying colon cancer or infection of the biliary tree. If either of these is suspected then ERCP or colonoscopy is a potentially more appropriate investigation. In the absence of any GI symptoms it wouldn't be suspected as the underlying cause of his presentation.

B Lumbar puncture

The lack of headache or symptoms of meningism counts against CNS infection as the cause of this patient's symptoms.

C Abdominal ultrasound scan

Abdominal ultrasound scan is a relatively insensitive method to confirm a source for any infection, given there are no symptoms of biliary tract or urinary infection.

D CT abdomen

CT abdomen is most useful in identifying an intra-abdominal abscess, active diverticular disease or other conditions such as ischaemic bowel as causes of this patient's acute presentation, none of which are suspected here.

32301

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A 68-year-old male is admitted to hospital with progressively severe shortness of breath of two days' duration. He is known to have ischaemic cardiomyopathy and an ejection fraction of 30%. On arrival his respiratory rate is 35/minute; oxygen saturation by pulse oximetry is 81% and chest X-ray shows bilateral pulmonary infiltrates and cardiomegaly. He is intubated, mechanically ventilated and started on IV infusion of furosemide 6 mg/h and nitroglycerine 25 g/min. Over the next three days he achieves a negative fluid balance of 3.2 l and chest X-ray shows decrease in pulmonary infiltrates. Serial cardiac enzymes are normal except for slightly elevated troponin T. However, the next day when extubation is planned he becomes hypotensive, blood pressure 80/50 mmHg and the infiltrates on chest X-ray worsen. You note that his bloods that morning have revealed a CRP of 189 mg/l, and neutrophils are above the upper limit or normal.

A Swan–Ganz catheterisation is performed and reveals:

Pulmonary capillary wedge pressure (PCWP)	8 mmHg
Cardiac output	5 l/min
Cardiac index	3 l/min/m^2
Systemic vascular resistance	650 dynes s/cm–5 (700–1100)

Furosemide and nitrates are stopped but blood pressure fails to improve.

Which of the following is the most appropriate next step in the management of this patient?

A	Haemodialysis
B	Normal saline 500 ml IV bolus
C	IV Dobutamine infusion
D	IV Dopamine infusion
E	Left ventricular assist device (LVAD)

32302

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Explanation

B Normal saline 500 ml IV bolus

The haemodynamic parameters in this patient - low systemic vascular resistance and normal cardiac index and cardiac output - are suggestive of septic shock. This is probably secondary to ventilator-associated pneumonia. It occurs 48–72 h after admission, and worsening pulmonary infiltrates despite negative fluid balance are suggestive of chest infection. Appropriate management is fluid resuscitation to achieve optimal left heart filling pressure, and IV antibiotics.

A Haemodialysis

Haemodialysis would be considered in the event that renal function deteriorated despite optimal fluid management and IV antibiotic therapy.

C IV Dobutamine infusion

Inotropes are generally avoided if possible in patients with ischaemic cardiomyopathy because of the risk of worsening LV function as a result of negatively impacting on ischaemia.

D IV Dopamine infusion

Renal-dose dopamine was commonly used to manage acute renal impairment associated with sepsis, although controlled trials suggest it has limited efficacy. In this situation fluid replacement and IV antibiotics are more appropriate first steps.

E Left ventricular assist device (LVAD)

An LVAD might be considered once fluid replacement and IV antibiotic therapy have been optimised, in the event that blood pressure and urine output are both suboptimal.

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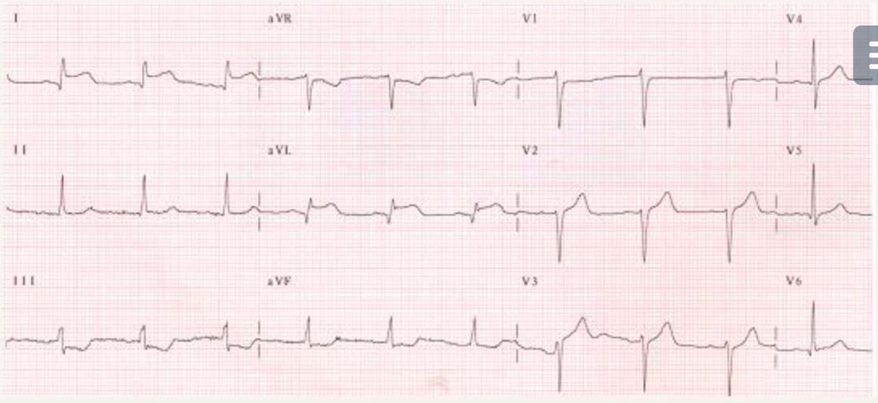
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Responses Total:	139
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A 76-year-old male presents with history of retrosternal chest pain of 20 min duration. The pain started while he was going for his morning walk and was associated with sweating and nausea. He is known to have diabetes mellitus for 15 years and hypertension for 5 years. His current medications include metformin 850 mg twice daily, 20 units per day of insulin glargine and indapamide 1.5 mg daily. On physical examination he is anxious and sweating. His pulse rate is 48/minute, blood pressure 145/85 mmHg and respiratory rate 20/min. He has an ejection systolic murmur localised at the aortic area, and brisk carotid upstroke.
His chest X-ray is normal and electrocardiogram (ECG) whilst in pain is shown below.



What is the most likely diagnosis?

A	Inferior transmural MI
B	Inferior subendocardial MI
C	Anterior transmural MI
D	Lateral transmural MI
E	High lateral wall MI

32303

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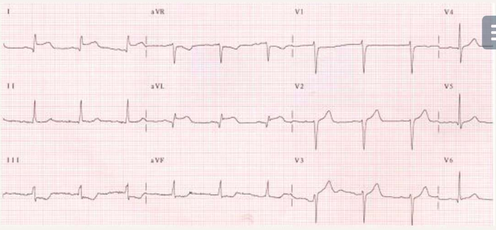
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Normal Values

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Explanation

E	High lateral wall MI

ST segment elevation in leads I and aVL is termed as high lateral wall MI, and is usually the result of occlusion of the first diagonal branch of the left anterior descending artery, though occlusion of other arteries like branches of the left circumflex or a short left anterior descending artery may cause the same picture. As the patient has ST elevation with ongoing chest pain, he should be referred for urgent PCI. He is relatively bradycardic, but this is likely to be related at least in part to ischaemia and should resolve after reperfusion occurs.

A	Inferior transmural MI

This would be associated with ST elevation in the inferior leads, (II, III and aVF).

B	Inferior subendocardial MI

This would be associated with ST depression in the inferior leads, but the ST elevation in I and aVL seen here would not be expected.

C	Anterior transmural MI

In this situation ST elevation in leads V1-V4 would be expected.

D	Lateral transmural MI

A lateral transmural MI would usually be associated with ST elevation in V5 and V6.

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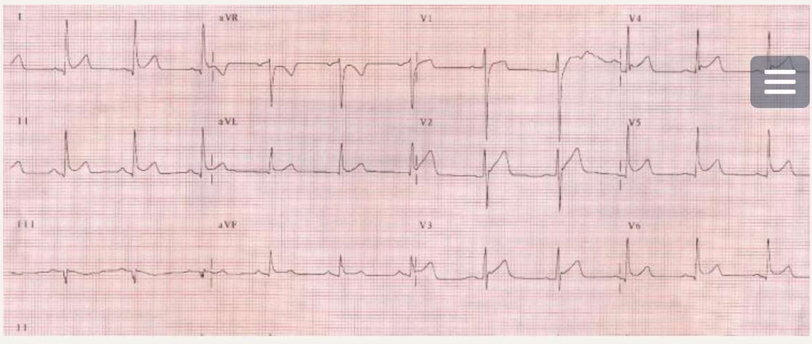
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A 38-year-old carpenter had been feeling unwell for 1 week with rhinorrhoea, dry cough, generalised myalgia and low-grade fever. For the past 8 h he has experienced substernal chest pain that is sharp and increases with respiration, and is slightly relieved when he leans forward. There is no radiation, sweating, palpitations or shortness of breath. He has no past medical history of note. Physical examination reveals a well-built young male, not in any distress. His pulse rate if 68/min, blood pressure 144/84 mmHg and respiratory rate 14/min. There is a pericardial friction rub best heard at the left sternal edge. The rest of the examination is unremarkable.

Investigations:

Hb	16 g/dl
WCC	7.8×10^9/l
PLT	550×10^9/l
ESR	32 mm/1st hour

The electrocardiogram (ECG) is shown below.



Which one of the following electrocardiographic features is most helpful in establishing the diagnosis of acute pericarditis?

A	T wave inversion in aVR
B	Normal QRS axis
C	PR segment depression in lead II and elevation in aVR
D	Early transition of R waves in chest leads
E	RS pattern in lead V1

32304

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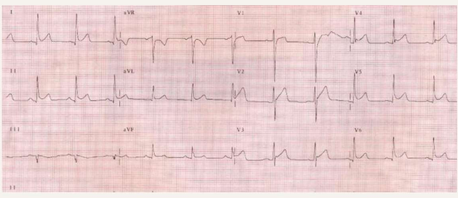
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D	Early transition of R waves in chest leads
E	RS pattern in lead V1

Explanation

C	PR segment depression in lead II and elevation in aVR

The clinical features and electrocardiogram (ECG) in this patient are consistent with a diagnosis of acute pericarditis. The electrocardiographic differential diagnosis of acute pericarditis is myocardial infarction and early repolarisation abnormality. It can be differentiated from myocardial infarction by concavity of ST segment elevation and localisation of ST segment elevation to infarct-related artery and, given his age and prodromal symptoms, pericarditis is the more likely cause. However, these two ECG features do not differentiate acute pericarditis and early repolarisation abnormality. The two most helpful differentiating features are PR segment depression, which is usually best seen in lead II and V6, and PR segment elevation in aVR. This results from injury current that is directed towards aVR. An ST/T ratio greater 0.25 or a T-wave amplitude of less than or equal to 3 mm also has high positive and negative predictive value in diagnosis of acute pericarditis.

A	T wave inversion in aVR

The T wave is normally inverted in aVR in adults, and hence it isn't a useful differentiator towards pericarditis.

B	Normal QRS axis

Although constrictive pericarditis is associated with right axis deviation, a normal QRS axis doesn't rule pericarditis in or out.

D	Early transition of R waves in chest leads

Early transition of R waves may be seen in some normal individuals, and hence it isn't a useful marker of pericarditis.

E	RS pattern in lead V1

An RSR pattern in lead V1 is indicative of right bundle branch block, which may or may not be associated with acute pericarditis.

32304

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A 26-year-old man was admitted to the Emergency Department with acute cardiac failure. Previously fit and well, his past medical history is unremarkable. He presented with a three-day history of central chest pain, fever and shortness of breath. Initially he had generalised muscle pains; he then developed chest pain and a cough productive of yellowish sputum. The chest pain radiated to his back and the shortness of breath was progressive. When he presented, he could not complete a sentence in one breath because of breathlessness.
On examination, he was dyspnoeic, febrile and sweaty with a pulse rate of >100/min, respiratory rate of 32/min and a blood pressure was 81/43 mmHg. His jugular venous pressure was slightly raised at 4 cm. First, second and a third heart sounds were heard producing a gallop rhythm. Respiratory examination revealed widespread crackles and scattered rhonchi bilaterally.

Investigations:

Hb	15.8 g/dl
WCC	18 × 10^9/l (lymphocytosis)
PLT	210 × 10^9/l
Na+	136 mmol/l
K+	4.1 mmol/l
Creatinine	131 mol/l
Bicarbonate	23.4 mmol/l
MCV	88.6 fl
Urea	9.7 mmol/l
Mg^{2+}	0.81 mmol/l
Troponin T	12.4 units (normal is <<0.01)
ECG	Sinus rhythm with a right bundle branch block at a rate of 123/min
CXR	Enlarged globular heart with evidence of pulmonary oedema
Echocardiogram	A small pericardial effusion with a normal left ventricular size but very poor global left ventricular function; the ejection fraction was 25%
Pulmonary capillary wedge pressure (PCWP)	21 mmHg

Blood gases on 100% oxygen:

pH	7.5
$p(O_2)$	15.10 kPa
$p(CO_2)$	3.43 kPa

He is given diamorphine, pain relief, and catheterised.

Which of the following interventions would you immediately commence in addition in this patient?

A	Intravenous gelofusin
B	Inotropic support
C	DC cardioversion
D	Thrombolysis
E	Potassium and magnesium replacement

32305

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Explanation

B Inotropic support

This patient, with a likely diagnosis of acute viral myocarditis, is in cardiogenic shock. In this case with a PCWP >15 mmHg, inotropic support is the most appropriate next step. If PCWP <15 mmHg, then cautious intravenous (IV) fluids (colloids) should be given in 100–200 ml. A small amount of dimorphine is beneficial as it vasodilates and reduces anxiety. Early cardiology consultation is advised. Left ventricular assist devices are also recognised to improve outcomes in this situation.

A Intravenous gelofusin

This patient's PCWP is already above 15 mmhg, and hence further fluid loading is not appropriate.

C DC cardioversion

This patient is tachycardic due to her cardiac failure rather than to a rhythm disturbance requiring cardioversion.

D Thrombolysis

Although this patient is in hypotensive cardiac failure, there is no indication that this is ischaemic in origin and hence thrombolysis isn't required.

E Potassium and magnesium replacement

Both magnesium and potassium are within the normal range, and hence replacement is not required in this situation.

32305

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A 71-year-old lady is admitted to the Emergency Department with severe central chest pain. The chest pain has been there for 40 min and is also felt in the arms and jaw. There is associated shortness in breath. Her past medical history includes: hypertension, osteoarthritis and diet-controlled diabetes mellitus. She is on the following medications: bendrofluazide 2.5 mg od, amlodipine 10 mg od and paracetamol 500 mg prn. She takes occasional alcohol and has smoked since she was 16 years of age (about 10 cigarettes/day).
On examination, she is distressed with a blood pressure of 90/45 mmHg, pulse of 38/min and regular. Her jugular venous pressure is raised to 7 cm with intermittent cannon waves. Her heart sounds are heard with a variable first heart sound. Her respiratory rate is 26/min and her chest is clinically clear.

Investigations:

Blood gases on 60% oxygen:	
pH	7.45
$p(O_2)$	15.10 kPa
$p(CO_2)$	3.77 kPa

Bicarbonate	22.4 mmol/l
Haemoglobin	15.8 g/dl
Mean Cell Volume	88.6 fl
Platelets	250×10^9 /l
White cell count	13.1×10^9 /l
Sodium	136 mmol/l
Potassium	4.1 mmol/l
Urea	7.7 mmol/l
Creatinine	121 mol/l
Magnesium	0.81 mmol/l
Electrocardiogram (ECG)	More than 2 mm of ST elevation in II, III, aVF and ST depression in V1–V3, complete heart block
Chest X-ray	Normal

You instigate a fluid bolus

Which of the following other treatments would you plan for next?

A	Nitrate infusion
B	Thrombolysis
C	PCI
D	Transvenous Pacing
E	IV furosemide

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Explanation

C	PCI

This patient has right ventricular infarction and complete heart block. Right ventricular (RV) infarction results in elevated right-sided pressures and low left-sided pressures. Nitrates and diuretics should be avoided as they reduce preload and can worsen hypotension. The aim is to maintain a high right ventricular preload by an initial fluid bolus. This patient has complete heart block, although this should resolve once revascularisation is achieved via PCI. If not, then temporary venous pacing would be a logical addition to therapy.

A	Nitrate infusion

Nitrate infusion can further reduce preload and drive significant hypotension, and thus it should be avoided here.

B	Thrombolysis

PCI has superior outcomes to thrombolysis in this situation and is therefore the preferred option.

D	Transvenous Pacing

Heart block often resolves in right ventricular infarction after the acute ischaemia is relieved, and hence pacing may not be required.

E	IV furosemide

In this situation diuretics may reduce right ventricular filling pressure and further exacerbate hypertension.

32306

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A 69-year-old man is admitted to the Emergency Department with sudden onset of palpitations. The palpitations started 3 h ago, and are associated with shortness of breath, light-headedness and chest discomfort. He has had two similar episodes of palpitations in the last 2 months that have lasted only a few seconds. He had never sought any medical advice on these previous palpitations. His past medical history is unremarkable and he is not on any medication.
On examination, he is dyspnoeic with a blood pressure of 112/55 mmHg, pulse rate of >>120/min regular and a respiratory rate of 28/min. His oxygen saturation on air is 90%, and his chest is clinically clear. His jugular venous pressure is not raised. First and second heart sounds are heard but you cannot appreciate whether there is any murmur.

An electrocardiogram (ECG) shows a heart rate of 188/mim with a narrow QRS complex; chest X-ray is normal.

The patient is placed on a monitor and given rapid IV 6 mg of adenosine, but the heart rate only slows down to 176/min. The patient is then given 12 mg of adenosine and the heart rate slows to 110/min to reveal the underlying atrial fibrillation. He is also given oxygen and low-molecular weight heparin.

ECG shows a heart rate of 110/min and atrial fibrillation.

Which of the following interventions would you immediately start for this patient?

A	DC cardioversion
B	Loading dose of IV 0.75–1 mg digoxin in 50 ml saline over 1–2 h
C	Glycoprotein IIb/IIIa inhibitor
D	IV amiodarone
E	Angiotensin-converting enzyme (ACE) inhibitor

32307

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Calculator

Normal Values

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D	IV amiodarone
E	Angiotensin-converting enzyme (ACE) inhibitor

Explanation

D	IV amiodarone

This patient has atrial fibrillation, which given the history is probably of relatively acute onset. The immediate need would be to try and manage chemical cardioversion, in which case IV amiodarone is an obvious choice. Digoxin would not encourage reversion to sinus rhythm so would not be the first choice here. The likely outcome is the patient reverting back to sinus rhythm within hours. If the patient does not revert back to sinus rhythm, formal anticoagulation would need to be instituted. He would also need to be investigated for the cause of the atrial fibrillation. Electrical cardioversion may be an option acutely if he becomes significantly compromised with respect to his BP, or considered at a later date as an elective procedure post oral anticoagulation.

A	DC cardioversion

This patient has a well-maintained blood pressure and it is unclear how long he has been in AF; chemical cardioversion is therefore the preferred option.

B	Loading dose of IV 0.75–1 mg digoxin in 50 ml saline over 1–2 h

In this situation with a relatively short duration of AF, it is reasonable to try and attain sinus rhythm with amiodarone.

C	Glycoprotein IIb/IIIa inhibitor

Platelet inhibition isn't the most important next step, control of the patient's atrial fibrillation is. In the event there is a strong suspicion of ACS, then the first-line interventions are high-dose aspirin, clopidogrel and fondaparinux.

E	Angiotensin-converting enzyme (ACE) inhibitor

ACE inhibition may precipitate worsening hypertension and won't impact on this patient's ventricular rate.

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A 64-year-old lady who has been diagnosed with a first deep vein thrombosis is about to be discharged from the ward.. She has been started on warfarin. She has a past history of hypertension, COPD and type 2 diabetes, and is very concerned about possible changes to her medication and lifestyle.

Which one of the following pieces of information would give to this patient?

A	She can continue to take regular paracetamol
B	She must avoid excessive leafy green vegetables
C	She must avoid any alcohol consumption
D	She needs to take warfarin for up to a year
E	She should always take her warfarin with a meal

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E	She should always take her warfarin with a meal

Explanation

A	She can continue to take regular paracetamol

Although interactions between paracetamol and warfarin have been reported, regular paracetamol is unlikely to impact on her INR and would be considered much safer than the use of NSAIDs.

B	She must avoid excessive leafy green vegetables

Enjoyment of a normal, healthy, balanced diet is not thought to significantly impact on INR.

C	She must avoid any alcohol consumption

It's important to avoid binge drinking. Regular small amounts of alcohol would be considered low risk in this situation.

D	She needs to take warfarin for up to a year

Anticoagulation for a period of 3 months for DVT is recommended, although for recurrent DVT lifetime therapy may be considered.

E	She should always take her warfarin with a meal

There is no requirement to take warfarin with food, although aiming to take warfarin at the same time each day is advised.

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A 69-year-old man presented to the Emergency Department of a District General Hospital with central chest pain. The hospital does not have an on-site acute angiography service. The pains started when he was walking uphill from the park to his house. The pains were very severe and radiated to his neck, jaw and left arm. The severe pains lasted for about an hour and this was 5 h ago. He had never experienced such severe pains before and thought he was going to die. He still has some dull chest pains but not very severe. He felt nauseated but did not vomit. In the past, he has occasionally had some chest tightness, which came on with strenuous exertion, and he had managed very well by avoiding activities that brought the pain on. He is not on any medication.
On examination, he is alert, distressed, his blood pressure is 110/84 mmHg and pulse 76/min regular. First and second heart sounds are heard and there are no murmurs. His chest is clinically clear.

Investigations:

Hb	16.1 g/dl
WCC	13.2 × 10^9/l
PLT	256 × 10^9/l
Na^+	136 mmol/l
K^+	4.2 mmol/l
Creatinine	176 mol/l
MCV	82 fl
Urea	7.4 mmol/l
Troponin T	Awaited
ECG	Normal sinus rhythm, inferior ST depression
CXR	Unremarkable
O_2 saturation	96% on air

You give him diamorphine, fondaparinux and aspirin.

Which one of the following additional medications would you immediately start this patient on?

A	TPA
B	Tirofiban
C	Atorvastatin
D	Bisoprolol
E	Clopidogrel

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Explanation

E	Clopidogrel

This gentleman has chest pain which is suspicious for ischaemic cardiac pain, but his ECG is normal. The nature of his pain, however, means that it is prudent to manage him with fondaparinux, aspirin and clopidogrel until a troponin level is obtained. The upper limit of normal for troponin has recently been lowered, and with the success of angioplasty and aggressive preventative pharmacotherapy, the threshold for intervention in coronary disease has generally been lowered over the past few years. Of course if his cholesterol is elevated, statin therapy is highly likely to be instigated.

A	TPA

TPA isn't indicated as there is no evidence yet of a STEMI; in any case, PCS is preferred to thrombolysis for the treatment of STEMI.

B	Tirofiban

Tirofiban is a IIbIIIa platelet inhibitor and is indicated for use in NSTEMI, although use of IIbIIIa inhibitors has largely been superseded by high-dose PY12 inhibitors such as clopidogrel in combination with aspirin.

C	Atorvastatin

Of course statins are indicated in this patient population, although the most important intervention early in treatment is the move to dual anti-platelet therapy.

D	Bisoprolol

Beta blockade is useful in reducing myocardial oxygen demand and does impact on CV outcomes in this population, although immediate initiation of therapy isn't essential.

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A 69-year-old man presented to the Emergency Department with central chest pain. The pains started when he was walking uphill from the park to his house. The pains were very severe and radiated to his neck, jaw and left arm. The severe pains lasted for about an hour and this was 12 h ago. He had never experienced such severe pains before and thought he was going to die. He still has some residual dull chest ache. He felt nauseated but did not vomit. In the past, he occasionally had some chest tightness that came on with strenuous exertion and he had managed very well by avoiding activities that brought the pain on. He is not on any medication.
On examination, he is alert, distressed, his blood pressure is 106/60 mmHg and pulse 51/min regular. First and second heart sounds are heard and there are no murmurs. His chest is clinically clear.

Investigations:

Hb	16.1 g/dl
WCC	13.2 × 10^9/l
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Na+	136 mmol/l
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Creatinine	132 mol/l
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Hs-troponin	2× upper limit of normal
ECG	Normal sinus rhythm with ST depression of 1 mm in leads II, III and aVF
CXR	Unremarkable
O_2 saturation	95% on air

Which of the following is the most appropriate treatment?

A	Beta blockade and early outpatient angiography
B	Clopidogrel, aspirin, low molecular weight heparin and inpatient stress-test
C	Clopidogrel, aspirin, low molecular weight heparin and Inpatient angiography
D	Beta blockade and oral nitrate
E	Aspirin, low-molecular weight heparin and tirofiban

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C	Clopidogrel, aspirin, low molecular weight heparin and Inpatient angiography
D	Beta blockade and oral nitrate
E	Aspirin, low-molecular weight heparin and tirofiban

Explanation

C	Clopidogrel, aspirin, low molecular weight heparin and Inpatient angiography

This gentleman is high risk; his symptoms, ECG changes and investigations are consistent with an NSTEMI. In this case he may well be considered for inpatient angiography. High-dose clopidogrel and aspirin are now the treatments of choice in conjunction with fondaparinux.

A	Beta blockade and early outpatient angiography

This patient is at very high risk of a STEMI, and thus beta blockade alone and outpatient angiography is inappropriate.

B	Clopidogrel, aspirin, low molecular weight heparin and inpatient stress-test

Stress testing is discouraged according to NICE guidance, as it may either precipitate ischaemia or generate a false-negative result.

D	Beta blockade and oral nitrate

Although beta blockade will have positive effects on reducing myocardial oxygen demand, the risk of STEMI in the short term will remain significant.

E	Aspirin, low-molecular weight heparin and tirofiban

The use of IIbIIIa inhibitors has been largely superseded by high-dose clopidogrel and aspirin in conjunction with fondaparinux.

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An 82-year-old lady presented to the Emergency Department with very severe chest pain that she had experienced continuously for the last 2 h. The chest pain was central and radiated to the neck and the left arm. There was a history of nausea and she vomited twice. On examination she was distressed, her blood pressure was 150/90 mmHg and pulse 102/min. First and second heart sounds were heard and there was a pansystolic murmur radiating to the axilla. Her chest was clinically clear.

An electrocardiogram (ECG) showed ST elevation in leads V1–V4, and
chest X-ray appeared normal.

She is referred for PCI and you next review her on the coronary care ward a few days later.

Which of the following medications has been shown to have the greatest impact on future risk of ischaemic cardiovascular events in this population?

A	Beta-blockers
B	Long-acting nitrate
C	Thiazide diuretic
D	Dihydropyridine calcium channel blocker
E	Dipyridamole MR

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Explanation

A	Beta-blockers

The first international Study of Infarct Survival (ISIS-1) showed that atenolol reduced mortality by 15% during the first week after an ST elevation myocardial infarction (STEMI). The benefits of atenolol were seen for up to 1 year.

B	Long-acting nitrate

Although long-acting nitrates improve symptoms in patients with angina, they haven't been shown to have a significant impact on ischaemic cardiovascular events.

C	Thiazide diuretic

Although blood pressure lowering irrespective of therapy has been shown to benefit cardiovascular outcomes, a greater benefit on outcomes is thought to be seen with use of either ACE inhibitor or ARBs (see the ANBP2 study).

D	Dihydropyridine calcium channel blocker

Dihydropyridine calcium channel blockers do benefit outcomes via blood pressure lowering, although greater positive effects on outcomes are thought to come from either ACE inhibitors, ARBs, beta blockers or I(f) channel inhibitors.

E	Dipyridamole MR

Dipyridamole MR has been shown to have positive effects on secondary stroke risk when used in conjunction with aspirin (in the ESPS2 study).

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A 26-year-old female comes to the cardiology clinic having been referred by her general practitioner (GP). She has suffered from progressive shortness of breath for 8 months. She is really worried now because even minimal exertion is making her breathless. She has no palpitations, cough or chest pains. Her past medical history is unremarkable and she takes no medication. She has been seeing her GP over the last 2-3 months but he could not detect any abnormally. Her full blood count (FBC), urea and electrolytes, liver function tests (LFTs) and chest X-ray (CXR) were all reported as normal.
On examination, her blood pressure is 125/60 mmHg, pulse is 86/min and regular. Her jugular venous pressure is raised to 5 cm, there is a parasternal heave and apex beat is in the 5th intercostals space at the mid-clavicular line. She has an increased pulmonary component of second heart sound and tricuspid regurgitation. FBC, LFTs and blood biochemistry are within the normal range.

CXR shows enlarged central pulmonary arteries and clear lung fields.
Electrocardiogram (ECG) shows right axis deviation, tall R waves in V1–V2 and right ventricular strain pattern.

Echocardiogram demonstrates tricuspid regurgitation, right ventricular enlargement, a reduction in left ventricular cavity size and abnormal septal configuration consistent with right ventricular pressure overload.

There is a positive response to acute vasodilator testing.

Which one of the following medications is appropriate first-line therapy in the treatment of this condition?

A	Calcium channel blockers
B	Beta-blockers
C	Hydralazine
D	Prostacyclin
E	Angiotensin-converting enzyme (ACE) inhibitors

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Normal Values

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Explanation

A Calcium channel blockers

The above young lady presents with the classical signs and symptoms of primary pulmonary hypertension (PPH). Obesity, portal hypertension, anorexigens, HIV and systemic hypertension have all been implicated in the development of PPH. Whilst only 10-15% of patients appear to have a pulmonary vascular tree responsive to calcium antagonism, these agents still constitute the initial therapy of choice according to guidelines, but only in those patients who show a response to vasodilator testing. Options for later-stage disease include endothelin receptor antagonists (which may be associated with peripheral oedema and hepatotoxicity); PDE-5 inhibitors such as sildenafil; and prostacyclin, which has been shown when given in infusion to impact on both quality of life and survival time.

B Beta-blockers

Beta blockade has no impact on outcomes in primary pulmonary hypertension, and it should therefore be avoided here.

C Hydralazine

Hydralazine is an option for treating patients with left ventricular dysfunction where ACE inhibitors are neither tolerated nor contraindicated.

D Prostacyclin

Prostacyclin is an option for later-stage primary pulmonary hypertension and can be used in combination with endothelin receptor antagonists and PDE-5 inhibitors.

E Angiotensin-converting enzyme (ACE) inhibitors

ACE inhibitors have a primary role in the treatment of left ventricular dysfunction.

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A 21-year-old model attends his GP complaining of feeling unwell. His symptoms began within the previous 2–3 weeks and include tiredness and fatigue, fever, loss of appetite and weight loss, and general aches and pains over his body. He had delayed coming to see his GP since he thought it was a flu-like illness but his symptoms have been getting worse. He is otherwise medically fit and is not on any medication. He denies being a smoker and does not drink but does not give a forthright answer to a question about recreational drug use. The GP examines the patient thoroughly and notes a temperature of 38°C, tachycardia and the presence of a previously unrecorded cardiac murmur. A diagnosis of endocarditis is suspected and the GP immediately sets about obtaining the first set of blood cultures.

Which one of the following clinical features/investigations would most add credence to the suspected diagnosis?

A	Recent dental extraction
B	Normal ESR
C	Microscopic haematuria
D	Subconjunctival haemorrhages
E	Palmar erythema

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E	Palmar erythema

Explanation

C	Microscopic haematuria

Most patients with endocarditis have evidence of vasculitis, strongly associated with microscopic haematuria. Other vasculitic features include splinter haemorrhages, Osler's nodes (finger/toe pulp infarcts) and Janeway lesions (palmar/plantar macules). Patients may also be clubbed.

A	Recent dental extraction

Dental extraction is common, and the vast majority of procedures are carried out with no sequelae. Risk of infection after dental extraction is increased in patients with a history of valvular disease.

B	Normal ESR

Marked elevation in ESR is the norm for patients with bacterial endocarditis.

D	Subconjunctival haemorrhages

Subconjunctival haemorrhages may occur for a number of reasons, including severe coughing, head injury and uncontrolled hypertension.

E	Palmar erythema

Palmar erythema is associated with liver failure rather than with bacterial endocarditis.

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You are a cardiology senior house officer in the outpatient department. A 66-year-old woman comes for her annual review. She had a mechanical valve replacement 4 years ago, for severe aortic stenosis. She has been well until 3 weeks ago. Her present complaint is that of weight loss, poor appetite and breathlessness. She reports that the symptoms started after she attended a general surgical appointment for rectal bleeding.

On examination she is thin with conjunctival pallor. There is evidence of splinter haemorrhages on both hands. A metallic valve click is not audible at the bedside and on auscultation of the heart sounds, a normal first sound is heard with a soft metallic second sound. There is an ejection systolic murmur at the second right intercostal space, right sternal edge. There is also an early diastolic murmur at the lower left sternal edge accentuated by forced expiration.

You arrange urgent admission for this lady with a diagnosis of infective endocarditis on the metallic valve prosthesis. A trans-oesophageal echocardiogram is awaited.

Which of the following investigations is most important in guiding further management?

A	Urinalysis
B	Blood cultures
C	12-lead ECG
D	Urgent abdominal ultrasound
E	Urgent colonoscopy

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D	Urgent abdominal ultrasound
E	Urgent colonoscopy

Explanation

B	Blood cultures

This lady is unwell with prosthetic valve endocarditis, as evident by the examination findings mentioned in the question stem. While all the above tests are reasonable, the question is for the investigation most important in guiding further management.

Blood cultures is the correct answer because these will enable antibiotic therapy to be targeted within 48 h of starting treatment. Because bacteraemia may be periodic, blood cultures should be taken from separate sites, ideally 1 h apart if possible.

A	Urinalysis

This will help to confirm the diagnosis in mind but not alter the management plan.

C	12-lead ECG

First-degree heart block, if new, might suggest aortic root abscess with AV nodal injury. While this information will certainly help us gauge the severity of the infection, it will not guide our choice of antibiotics.

D	Urgent abdominal ultrasound

It may help to detect evidence of septic emboli, for example splenic infarction, it will not indicate the organism responsible for targeted treatment.

E	Urgent colonoscopy

Intra-abdominal pathology, including colonic carcinoma, is a possible source of infecting organisms in this case, namely *Streptococcus gallolyticus* (formerly *S. bovis*). However, blood cultures would be the way to confirm the infecting organism in question.

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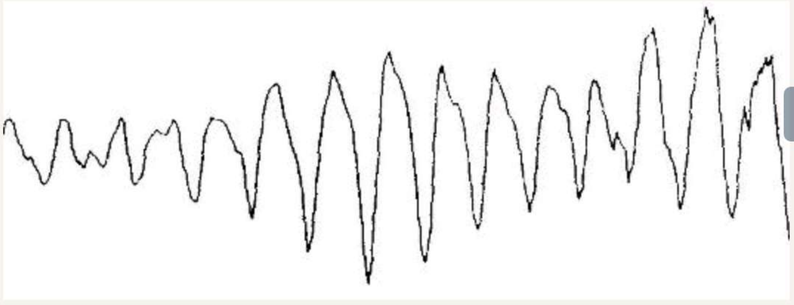
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You are an ST2 at a district general hospital. You are on-call as the middle grade cover as the registrar has gone off sick. You are called to the resuscitation department to see a 71-year-old man who collapsed at home. His wife called the ambulance but on arrival of the ambulance crew the patient was alert, she is 80 years old and has remained at home. The paramedics report the initial rhythm strip showed sinus rhythm. On the monitor in the emergency department it is noticed he has episodes of non-sustained broad complex tachycardia. The patient denies any chest pain and does not remember anything preceding the collapse. There is no past medical history of note.
On examination his blood pressure is 150/85 mmHg, heart rate 75/min regular, temperature 36.6°C, oxygen saturations 99% on 10 l/min. His Glasgow Coma Score is 15/15; there are no tongue abrasions or evidence of urinary incontinence. The cardiovascular, respiratory and neurological examination is unremarkable.

A rhythm strip taken during an episode of arrhythmia is shown below:



What is the most appropriate treatment for his rhythm disturbance?

A	Commence intravenous potassium replacement
B	Commence intravenous magnesium infusion
C	Commence intravenous 300 mg amiodarone followed by a maintenance dose
D	Administer intravenous adenosine boluses
E	Administer intravenous flecainide infusion over 30 min

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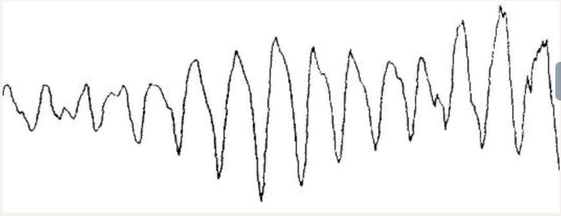
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What is the most appropriate treatment for his rhythm disturbance?

A	Commence intravenous potassium replacement
B	Commence intravenous magnesium infusion
C	Commence intravenous 300 mg amiodarone followed by a maintenance dose
D	Administer intravenous adenosine boluses
E	Administer intravenous flecainide infusion over 30 min

Explanation

Pharmacotherapy for polymorphic ventricular tachycardia is magnesium, which decreases calcium influx, reducing the amplitude of the VT and helping terminate runs of torsades. It is effective even when serum magnesium is normal. Common drugs that prolong QT interval can potentially cause torsades e.g. erythromycin, carbamazepine, ketoconazole and tricyclic antidepressants. Amiodarone, quinidine and flecainide are recognised to worsen the arrhythmia and adenosine is ineffective in terminating it. A collateral drug history is important as he may well have been exposed to agents which lead to long QT syndrome or those which cause hypomagnesaemia.

32316

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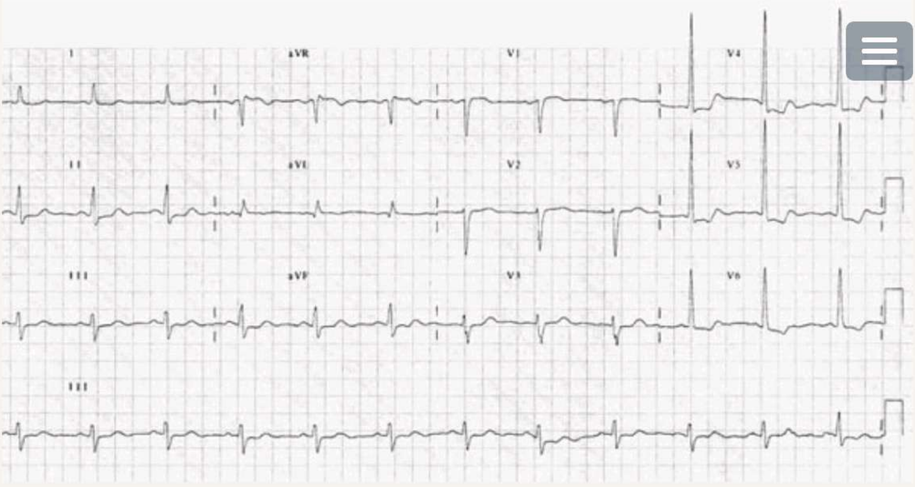
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Responses - % Correct:	0%

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You are a general medical senior house officer. A 45-year old African-Caribbean woman has been referred to you by her general practitioner (GP) after attending a well-woman clinic. Her GP is worried she may be hypertensive. Two blood pressure readings taken from her right and left arm are, respectively, 160/95 and 170/90 mmHg. The patient is well and asymptomatic. Apparently you understand that one of her relatives had trouble with a thyroid cancer at a relatively young age, but there is no other significant medical history. Her electrocardiogram (ECG) is shown below. Her full blood count and renal function are within the normal ranges.



What is the optimal initial management for her hypertension?

A	Ramipril
B	Indapamide
C	Amlodipine
D	Bisoprolol
E	Doxazosin

32317

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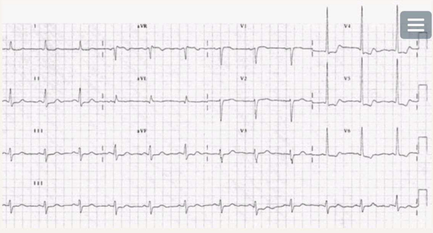
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Calculator

Normal Values

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D	Bisoprolol
E	Doxazosin

Explanation

C Amlodipine

Current NICE guidelines recommend using a calcium-channel blocker (CCB) to people aged over 55 years or to patients of African or Caribbean family origin of any age. The preference of CCB over an ACE inhibitor in this group of patients is as explained below.

As this woman has hypertension with evidence of end-organ damage, as indicated by left ventricular hypertrophy with lateral strain, medical therapy should be started. Concurrent premorbid risk factors should be assessed and treated, including hypercholesterolaemia and diabetes if identified. If possible the type of thyroid cancer suffered by her relative should be identified, as a medullary carcinoma is suggestive of MEN-2 and may lower the threshold for screening your patient for a phaeochromocytoma.

If a CCB is not suitable, for example because of oedema or intolerance, or if there is evidence of heart failure or a high risk of heart failure, offer a thiazide-like diuretic.

A Ramipril

Patients with hypertension aged under 55 years (except patients of African-Caribbean ethnicity) should be offered treatment with an angiotensin-converting enzyme (ACE) inhibitor or a low-cost angiotensin-II receptor blocker (ARB). If an ACE inhibitor is prescribed and is not tolerated (for example, because of cough), a low-cost ARB should be offered. ACE inhibitors are less effective in patients of African-Caribbean ethnicity due their generally lower circulating blood levels of ACE.

B Indapamide

Diuretics can be added as additional therapy for better control of hypertension. If diuretic treatment is to be initiated or changed, offer a thiazide-like diuretic, such as chlortalidone (12.5–25.0 mg once daily) or indapamide (1.5 mg modified-release once daily or 2.5 mg once daily) in preference to a conventional thiazide diuretic such as bendroflumethiazide or hydrochlorothiazide.

D Bisoprolol

Beta blockers are not a preferred initial therapy for hypertension. However, beta blockers may be considered in younger patients, particularly those with an intolerance or contraindication to ACE inhibitors and angiotensin II receptor antagonists, women of child-bearing potential or patients with evidence of increased sympathetic drive.

E Doxazosin

Alpha blockers can be added as an adjunct therapy in cases of resistant hypertension, usually after the patient has already been established on the other treatments listed above.

For guidance regarding the diagnosis and management of hypertension in adults, please refer to NICE guideline 127.

32317

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You are the on-call cardiology senior house officer (SHO) at a tertiary centre. You are asked to see a 72-year-old man, known to have mild aortic stenosis, admitted to the Surgical High Dependency Unit after having had a total left knee replacement under general anaesthetic. The procedure went well and as planned but unfortunately, in recovery an hour ago, the patient's heart rate was noted to jump to 165/min. The ward FY1 has then bleeped you seeking advice.

When you arrive the patient's observations show: RR 25/min, sats 98% on air, BP 75/40, HR 165/min and temperature 36.5°C. The FY1 has given 1L of Hartmann's solution over the last 1 hour with no change in the patient's blood pressure. His electrocardiogram (ECG) shows atrial fibrillation with left ventricular hypertrophy meeting voltage criteria and global ischaemic changes.

The patient is alert and appears anxious and complains of vague discomfort in the chest that began roughly half an hour ago. Capillary blood glucose measurement was normal.

Which of the following is the most appropriate next option for the management of this patient?

A	Rapid bolus of 6 mg IV adenosine
B	Single oral dose of 5 mg bisoprolol
C	Commence rapid loading of digoxin
D	Commence 300 mg loading dose of IV amiodarone
E	Arrange for synchronised DC cardioversion

32319

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Explanation

E	Arrange for synchronised DC cardioversion

This patient has developed a tachycardia with features of compromise, as evidenced by his low blood pressure (shock), ischaemic changes on ECG and new onset of chest pain. Other features of compromise include syncope/ loss of consciousness and signs of acute heart failure. The Resuscitation Council (UK) has provided us with a clear algorithm on the management of adults with tachy-arrhythmias, summarised in the flowchart in the weblink given below.

In an unstable patient, the algorithm is quite clear that the appropriate next step is DC cardioversion to restore a stable sinus rhythm. This should reverse the hypotension and rate-related ECG changes/chest pain. This should of course be done with the airway support of our anaesthetic colleagues if possible. The main risk of attempting cardioversion of any form is the risk of thromboembolic stroke. It is generally accepted that the first 24 h from the onset of atrial fibrillation is the 'safe window' for attempting cardioversion. In this case we have a clear time of onset.

A	Rapid bolus of 6 mg IV adenosine

The patient is compromised and needs immediate cardioversion to a stable rhythm. Furthermore, adenosine has no role in the management of atrial fibrillation. It might be considered as a treatment while setting up for DC cardioversion in patients with supraventricular tachycardias like AVRT or AVNRT.

B	Single oral dose of 5 mg bisoprolol

While this might have been an option if the patient was stable, this is a dangerous option in this case as it will likely drop his blood pressure further.

C	Commence rapid loading of digoxin

The emphasis here is that the patient has features of compromise and requires immediate cardioversion. If the patient had a reduced but borderline blood pressure with no other features of compromise, and was out with the 24-hour window for cardioversion, digoxin could be used with the intention of rate-control without causing hypotension.

D	Commence 300 mg loading dose of IV amiodarone

Amiodarone is the choice for chemical cardioversion but is incorrect in this case as it will likely take longer to achieve cardioversion, with the added side-effect of further lowering the patient's blood pressure during this time.

32319

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External Links

Peri-arrest arrhythmias
resus.org.uk/resuscitation-guidelines/peri-arrest-arrhythmias/>.

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A 70 year-old man with known type 2 diabetes is referred to the cardiology clinic by his GP with a three-month history of intermittent palpitations. He describes these as fast and irregular and of sudden onset and termination. He has felt quite light-headed on a couple of occasions during these palpitations but denies any chest pain or shortness of breath. The GP mentions in the referral letter that he has a borderline high blood pressure and was recently started on ramipril. There is no other past medical history of note. Examination reveals a blood pressure (BP) of 145/95 mmHg but is otherwise unremarkable. A routine electrocardiogram (ECG) shows sinus rhythm with left ventricular hypertrophy.

Investigations

Hb	13.1 g/dl
WCC	5.6 x 10^9/l
PLT	253 x 10^9/l
Na^+	136 mmol/l
K^+	4.8 mmol/l
urea	5.0 mmol/l
creatinine	99 μ mol/l
TSH	3 mU/l

A 24 h ambulatory ECG test reveals episodes of paroxysmal atrial fibrillation. An echocardiogram shows concentric hypertrophy with mild to moderate impairment of left ventricular systolic function, normal atria and no significant valvular pathology.

Which one of the following would be the anti-arrhythmic treatment of choice?

A	Flecainide
B	Bisoprolol
C	Digoxin
D	Amiodarone
E	Verapamil

32320

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Calculator

Normal Values

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Which one of the following would be the anti-arrhythmic treatment of choice?

A Flecainide

B Bisoprolol

C Digoxin

D Amiodarone

E Verapamil

Explanation

B Bisoprolol

This is the first-line treatment for patients with paroxysmal atrial fibrillation, for the reasons outlined in the stems below. The pharmacological management of atrial fibrillation (paroxysmal or not) comprises two main aspects: rate or rhythm control, as well as consideration of anticoagulation for stroke risk reduction. The decision for rate versus rhythm control is made taking into account a patient's cardiac and other medical history, along with echocardiogram findings. For instance, patients with injured myocardium from established ischaemic heart disease, or who have stretched/ dilated atria on echocardiogram, are less likely to achieve success with a rate-control focus. It might then be more practical to accept the presence of atrial fibrillation and opt for appropriate rate control.

This is the best option for a few reasons. It can limit the episodes of paroxysmal AF, aid rate control during the episodes and is beneficial for this gentleman's left ventricular systolic impairment and hypertension. With regard to anticoagulation, the risk of stroke from atrial fibrillation is calculated using the CHA2DS2-VASc score. A score of 0 is considered 'low' risk and may not require anticoagulation; a score of 1 is 'low-moderate' risk and anticoagulation should be considered; a score of 2 or greater is 'moderate-high' risk and the patient should be anticoagulated assuming no contraindications.

A Flecainide

Flecainide is contraindicated in patients with structural heart abnormalities or at risk of ischaemic heart disease.

C Digoxin

Digoxin does not reduce the risk of onset of atrial fibrillation and therefore does not have a role in paroxysmal AF.

D Amiodarone

While effective, this should be reserved for refractory cases due to its extensive side effect profile.

E Verapamil

Bisoprolol is the first-line option and also has the added virtue of evidence-based benefit in patients with left ventricular systolic dysfunction. However, this might be an option for acute rate control in a patient without signs of heart failure in whom a beta blocker is contraindicated - for example a patient with asthma.

32320

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A 75-year-old man is brought to the Emergency Department in a collapsed state. He had collapsed in a department store while doing some shopping with his wife. An ambulance was called and he was brought to the Emergency Department. He had received three direct current (DC) shocks on his way to the hospital in the ambulance.

On a quick look through his notes, he has a past medical history of psychotic depression for which he is on quetiapine and amitriptyline. He was admitted last week for the treatment of a lower respiratory tract infection and was commenced on clarithromycin. His admission ECG at the time showed sinus rhythm 84/min, normal axis and a QTc of 460 ms.

On examination now he 'does not feel right', with a blood pressure of 102/60 mmHg, HR >120/min and oxygen saturation of 93% on 35% oxygen. His electrocardiogram (ECG) reveals polymorphic VT.

Arterial blood gas analysis reveals that he is hypokalaemic.

Which of the following interventions would you immediately consider in this patient?

A	Amiodarone infusion
B	Magnesium sulphate and potassium infusion
C	IV sotalol
D	IV flecainide
E	Repeat DC cardioversion

32322

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Calculator

Normal Values

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D	IV flecainide
E	Repeat DC cardioversion

Explanation

B Magnesium sulphate and potassium infusion

This is the first-line treatment for torsades de pointes. Polymorphic VT is a form of ventricular tachycardia with wide QRS complexes of multiple morphologies seen on ECG. There are changing R-R intervals as well as axis of the QRS complexes. The key distinction to be made here is the difference between a diagnosis of torsades de pointes versus other forms of polymorphic VT. Not all polymorphic VT is torsades. The key is in the history. Torsades de pointes is a polymorphic VT in the context of a prolonged QT interval. First-line treatment would entail IV magnesium and correction of any electrolyte abnormalities. Other forms of polymorphic VT secondary to scar tissue after myocardial infarction would NOT respond to the same treatment and would likely require electrical or chemical cardioversion. Other therapies include overdrive pacing and isoproterenol infusion.

In this case the patient has a history of prolonged QTc with predisposing drugs, and was recently given an antibiotic known to further prolong the QT interval. This has likely precipitated his presentation with torsades de pointes. It is important to avoid drugs that further prolong the QTc.

A Amiodarone infusion

This is not an option for the treatment of torsades de pointes and can potentially worsen the situation via its QT-prolongation effects.

C IV sotalol

Sotalol prolongs the QT interval and has no role in the treatment of torsades.

D IV flecainide

Class IC antiarrhythmics like flecainide prolong the QT interval and might exacerbate Torsades.

E Repeat DC cardioversion

This would only be correct if the patient showed clear signs of cardiovascular compromise, for example with hypotension or complaints of new ischaemic-sounding chest pain.

32322

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A 51-year-old man is referred to the cardiology clinic with palpitations. The palpitations have been there for 6 months. He gets palpitations every other day and they last for up to a minute. The palpitations are not associated with shortness of breath, chest pain or dizziness and there is no obvious precipitating factor. His past medical history is unremarkable and he is not on any medication.

On examination, he is comfortable with a blood pressure of 132/72 mmHg and pulse rate of 66/min. Apex beat is in the 5th intercostal space in the mid-clavicular line and the jugular venous pressure is not raised. First and second heart sounds are heard, and there is a mid-systolic click with a late systolic murmur of grade 2/6 radiating to the axilla. Respiration, abdominal and central nervous systems are all normal.
Investigations:

ECG	sinus rhythm
Chest X-ray	normal
FBC, U/Es, LFTs, TFTs and lipid profile	are within normal range
24-hour tape	sinus rhythm throughout except four separate episodes of premature ventricular ectopics (PVEs). These episodes comprised 4–9 PVEs/minute
Echocardiogram	normal left ventricular function with an ejection fraction of 74%. There is mitral valve prolapse with mild to moderate mitral regurgitation

Which one of the following is the most appropriate initial intervention in this patient?

A	Mitral valve replacement
B	Mitral valvuloplasty
C	Bisoprolol
D	Coronary angiogram
E	Amiodarone

32323

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C	Bisoprolol
D	Coronary angiogram
E	Amiodarone

Explanation

C Bisoprolol

Bisoprolol is used for the suppression of ectopy. Mitral valve prolapse (MVP) affects about 5% of the general population and is more common in females. This man has mild to moderate mitral regurgitation on examination, and investigations are otherwise all normal apart from some PVEs on the 24 h tape. Crucially, his ejection fraction is normal.

Beta blockade is the initial treatment of choice for palpitations precipitated by PVEs. These work by reducing the occurrence and symptoms of the PVEs.

A Mitral valve replacement

Mitral valve replacement is only indicated in severe mitral regurgitation or if there are signs of concomitant LV compromise (reduced ejection fraction or new dilatation of the LV). This patient will need follow-up in clinic with repeat echocardiograms to monitor progression.

B Mitral valvuloplasty

This is a treatment for mitral stenosis and might worsen mitral regurgitation.

D Coronary angiogram

This patient has no regional wall-motion abnormality or history to suggest significant ischaemic heart disease. Coronary angiogram is therefore not indicated. However, if in the future a surgical mitral valve replacement were indicated, coronary angiogram would be part of the pre-op work-up for potential concomitant coronary artery bypass grafting.

E Amiodarone

Amiodarone is effective in suppressing ectopy but is only indicated if this is associated with significant haemodynamic compromise. We also need to consider the risk of substantial side effects with long-term amiodarone. Beta blockade is therefore the initial treatment of choice.

32323

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A 71-year-old lady is brought to the Emergency Department by an ambulance because of altered consciousness. Her husband gave a history that she had not been herself that morning. She had complained of a headache and some blurred vision earlier, before she stopped communicating and her right arm started shaking uncontrollably. She has osteoarthritis for which she takes ibuprofen 200 mg tid.

On examination, she is drowsy with a Glasgow Coma Scale (GCS) of 13/15. Her blood pressure (BP) is 220/115 mmHg, pulse 81/min and regular. Her respiratory rate is 20/min and her chest is clinically clear. Her jugular venous pulse is just visible, first and second heart sounds are heard with no added murmurs. There is no focal neurology.
Investigations:

ECG	sinus rhythm with left ventricular strain pattern
Chest X-ray	Cardiomegaly
Fundoscopy	papilloedema
FBC, U/Es, LFTs, TFTs, urinalysis and lipid profile	are within normal range
CT brain	unremarkable

Which one of the following interventions would you immediately start for this patient?

A	Sodium nitroprusside
B	Nifedipine
C	Methyldopa
D	Clonidine
E	Ramipril

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B	Nifedipine
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D	Clonidine
E	Ramipril

Explanation

A	Sodium nitroprusside

This patient mostly likely has hypertensive encephalopathy. Usually this is of gradual onset and may present with headache, nausea, vomiting, confusion and hypertensive retinopathy. The lack of focal neurology and normal CT head is reassuring with respect to ruling out a cerebral infarct and, more importantly, any haemorrhage/space-occupying lesion. The goal of therapy is to reduce the mean arterial pressure by approximately 25% over the first 24-48 h. An intra-arterial line can be helpful for continuous BP monitoring.

Sodium nitroprusside is a popular first-line agent for treating malignant hypertension and is given by continuous infusion. Its short-acting nature allows almost minute-by-minute titration according to response. Another popular first-line agent is IV labetalol, which is a combined alpha and beta receptor-blocker. It has the added benefit of easy IV to oral transition.

B	Nifedipine

Other forms of IV calcium channel blockers (like nicardipine or diltiazem) are sometimes considered as alternatives if the first-line options are unsuitable.

C	Methyldopa

Again this is not first-line therapy but could be considered in pregnancy along with hydralazine if other treatments like labetalol are ineffective. There is, however, a risk of worsening ischaemia.

D	Clonidine

While this is an effective antihypertensive agent, it is not the first-line treatment for hypertensive emergencies. Its use is also associated with the risk of worsening ischaemia, as well as rebound hypertension upon withdrawal of the medication.

E	Ramipril

This is one of the first-line drugs for chronic, 'non-urgent' hypertension as per national guidelines. It is important to recognise the severity and urgency of the hypertension in this case and to treat it differently.

32324

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A 26-year-old man was admitted to the Emergency Department with worsening shortness of breath. Previously fit and well, his past medical history is unremarkable. He gives a three-day history of central chest pain, fever and shortness of breath. Initially he had generalised muscle pains; he then developed chest pain and a cough productive of yellowish sputum. The chest pain radiated to his back and the shortness of breath was progressive. At presentation, he could not complete a sentence in one breath because of breathlessness. Clinically he was in severe acute decompensated heart failure with pulmonary oedema.

Investigations:

Hb	15.8 g/dl
WCC	18 × 10^9/l
PLT	210 × 10^9/l
Na+	136 mmol/l
K+	4.1 mmol/l
Creatinine	131 mol/l
MCV	88.6 fl
Urea	9.7 mmol/l
Mg^{2+}	0.61 mmol/l
Hs-troponin	>10,000 units (normal <35)
ECG	Sinus rhythm with a right bundle branch block at a rate of 130/min
CXR	Enlarged, globular heart with evidence of pulmonary oedema

The patient was stabilised with oxygen therapy, IV diuretics and a brief period of CPAP and inotropic therapy in CCU. A bedside trans-thoracic echocardiogram was performed which showed a small pericardial effusion with normal left ventricular size but very poor global left ventricular function. The ejection fraction was 15%.

His unsupported blood pressure is now 100/59 mmHg, with an NYHA symptom class of III-IV. There is still evidence of peripheral and some pulmonary oedema which is gradually improving on the ongoing IV furosemide therapy.

What is the most appropriate next step in this patient's management?

A	Refer for coronary angiography
B	Start low-dose beta-blocker
C	Start nitrate therapy
D	Refer for assessment of cardiac transplantation
E	Start low-dose ACE inhibitor

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Normal Values

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A 26-year-old man was admitted to the Emergency Department with worsening shortness of breath. Previously fit and well, his past medical history is unremarkable. He gives a three-day history of central chest pain, fever and shortness of breath. Initially he had generalised muscle pains; he then developed chest pain and a cough productive of yellowish sputum. The chest pain radiated to his back and the shortness of breath was progressive. At presentation, he could not complete a sentence in one breath because of breathlessness. Clinically he was in severe acute decompensated heart failure with pulmonary oedema.

Investigations:

Hb	15.8 g/dl
WCC	18 × 10^9/l
PLT	210 × 10^9/l
Na+	136 mmol/l
K+	4.1 mmol/l
Creatinine	131 mol/l
MCV	88.6 fl
Urea	9.7 mmol/l
Mg^{2+}	0.61 mmol/l
Hs-troponin	>10,000 units (normal <35)
ECG	Sinus rhythm with a right bundle branch block at a rate of 130/min
CXR	Enlarged, globular heart with evidence of pulmonary oedema

The patient was stabilised with oxygen therapy, IV diuretics and a brief period of CPAP and inotropic therapy in CCU. A bedside trans-thoracic echocardiogram was performed which showed a small pericardial effusion with normal left ventricular size but very poor global left ventricular function. The ejection fraction was 15%.

His unsupported blood pressure is now 100/59 mmHg, with an NYHA symptom class of III-IV. There is still evidence of peripheral and some pulmonary oedema which is gradually improving on the ongoing IV furosemide therapy.

What is the most appropriate next step in this patient's management?

A	Refer for coronary angiography
B	Start low-dose beta-blocker
C	Start nitrate therapy
D	Refer for assessment of cardiac transplantation
E	Start low-dose ACE inhibitor

Explanation

E	Start low-dose ACE inhibitor

This patient presented with cardiogenic shock probably secondary to acute viral myocarditis. The management is focused on best supportive care while instituting evidence-based therapy to assist recovery of left ventricular function. Diuretic therapy should be continued to achieve euvolaemia, and serial echocardiograms performed to monitor progress.

A	Refer for coronary angiography

This young patient with no prior cardiac history is unlikely to have significant coronary artery disease leading to his presentation. This might be considered if the patient were older with more in the history to suggest concomitant ischaemic heart disease, but even then would only be considered when the patient is more clinically stable.

B	Start low-dose beta-blocker

While beta-blockers are evidenced-based treatments for heart failure, we would not want to introduce this while the patient has ongoing symptoms of acute decompensated heart failure. This can be introduced at a later stage when the patient is stable.

C	Start nitrate therapy

This is a useful adjunct to temporarily "offload" patients with acute decompensated heart failure in addition to standard diuretic and supportive therapy. There are ongoing symptoms of heart failure but the patient is currently improving with diuretics and will now require therapies to help with the recovery of his ventricular function.

D	Refer for assessment of cardiac transplantation

This might be considered if the patient deteriorates despite best supportive care. Reintroduction of inotropic support, intra-aortic balloon pump insertion or use of left ventricular assist devices might be considered while awaiting cardiac transplantation.

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A 75-year-old man is referred for total hip replacement. He has a history of hypertension and angina and suffered a myocardial infarction some 8 years earlier. Current medication includes atenolol 50 mg daily, ramipril 10 mg daily, aspirin 75 mg daily, atorvastatin 20 mg daily and isosorbide dinitrate 60 mg. Blood pressure at the preoperative assessment was 160/80 mmHg, but he maintains that his readings with the general practitioner have been normal. He last had an exercise test some 3 years earlier and managed 8 min with no significant ECG changes.

Which of the following investigations in addition to standard physical assessment would be most appropriate for the preoperative assessment of this patient?

A	Repeat exercise ECG test
B	Routine echocardiogram
C	Nuclear myocardial perfusion scan
D	Stress echocardiogram
E	Cardiac MRI

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D	Stress echocardiogram
E	Cardiac MRI

Explanation

B	Routine echocardiogram

This is a common referral for cardiology clinics. It is important to have a good basic assessment of this patient's cardiac function to help shed light on his perioperative risk. This will all have an effect on potential haemodynamic changes during the surgery, as well as for any potential complications during the post-op period.

This option is will give us a wealth of information including the LV function, any existing regional wall-motion abnormalities and any significant valvular disease.

A	Repeat exercise ECG test

This gentleman has had a relatively recent exercise test with reasonably good results. Recent NICE guidelines have removed the exercise tolerance test as a suggested investigation for chest pain due to issues with its sensitivity and specificity.

C	Nuclear myocardial perfusion scan

Nuclear myocardial perfusion scan is used as an investigation for coronary artery disease in some centres, either to diagnose the presence of atherosclerosis (which we already know is present in this patient) or assess coronary flow reserve.

D	Stress echocardiogram

Stress echocardiogram is another means of investigating coronary artery disease. While additional tests will always give us more information, a standard echocardiogram is what is really needed and will suffice for this man's pre-op assessment.

E	Cardiac MRI

Cardiac MRI is commonly used in the assessment of new cardiac disease for which the aetiology is not immediately clear (for example young patients with new severe heart failure), or for objective assessment of myocardial status and disease.

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A 57-year-old man underwent angioplasty and stenting for myocardial ischaemia some 12 months earlier. He has presented three times since then to the Emergency Department complaining of different atypical chest pain. Each time there have been no significant ECG changes and serial serum troponin levels have been normal.

Which of the following options is the best to further investigate his symptoms?

A	CT coronary angiography
B	Invasive coronary angiography
C	Trans-oesophageal echocardiogram
D	Thallium myocardial perfusion scan
E	Tissue Doppler echocardiography

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Normal Values

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B	Invasive coronary angiography
C	Trans-oesophageal echocardiogram
D	Thallium myocardial perfusion scan
E	Tissue Doppler echocardiography

Explanation

D Thallium myocardial perfusion scan

This case illustrates a common cardiology presentation of a patient presenting with atypical chest pain against a background of known coronary artery disease. The next investigation would ideally be a low-risk procedure that can demonstrate continued patency of the previously stented coronary artery. Dobutamine-atropine stress echocardiography, thallium perfusion scanning and myocardial contrast perfusion echocardiography are all capable of localising areas of myocardial ischaemia. Contrast this with angiography modalities (CT and invasive catheter coronary angiography) that provide radiological evidence of coronary artery narrowing.

This is the ideal investigation in that it is non-invasive, providing information on myocardial ischaemia as well as functional information (dobutamine stress if needed).

A CT coronary angiography

This will provide angiographic detail of coronary anatomy but will not provide functional information. This is a potential option if thallium perfusion scanning is not available.

B Invasive coronary angiography

This is of course the gold standard for the assessment of coronary artery disease, but it does not come without risks. In this patient with atypical chest pain, we would ideally aim for an investigation with lower risk but with sufficient sensitivity to exclude ischaemia as a cause for his symptoms.

C Trans-oesophageal echocardiogram

Trans-oesophageal echocardiogram can provide further information on left ventricular function and valvular function when trans-thoracic echocardiogram imaging is suboptimal. However, it will not help us with the exclusion of ongoing ischaemia.

E Tissue Doppler echocardiography

Doppler assessment is used in echocardiography to assess blood velocity and direction of flow, as well as the movement of myocardium if used with the tissue Doppler modality. This enables further assessment of ventricular systolic and diastolic function, as an adjunct to standard echocardiographic measurements.

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A 35-year-old woman, who recently arrived in this country from Africa, presents with shortness of breath on exertion, and fatigue. On examination she is neither cyanosed nor clubbed, and is apyrexial. There is a right precordial heave, a wide split second heart sound and a pulmonary flow murmur. Her lung fields are clear. A chest X-ray shows cardiomegaly with prominent pulmonary arteries. Her ECG shows sinus rhythm and partial RBBB. Routine full blood count, liver function testing and urea and electrolytes are unremarkable. Transo-esophageal echocardiography is arranged.

Which of the following investigations would be most useful in deciding the next management step?

A	V/Q scan
B	Right heart catheterization
C	Arterial blood gas
D	Pulmonary function testing
E	High-resolution CT thorax

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Normal Values

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A	V/Q scan
B	Right heart catheterization
C	Arterial blood gas
D	Pulmonary function testing
E	High-resolution CT thorax

Explanation

B Right heart catheterization

Patients arriving from developing countries may have undiagnosed pathology, including conditions not commonly encountered in the United Kingdom. Her rather non-specific symptoms are compatible with cardiac or pulmonary disease. The physical signs are in keeping with right-sided cardiac volume overload or pulmonary hypertension. However, in pulmonary hypertension due to pulmonary disease or multiple pulmonary emboli, the pulmonary arteries are characteristically normal or pruned. The presence of a wide (often fixed) split second sound, right bundle branch block and prominent pulmonary vasculature are suggestive of an atrial septal defect. The absence of a temperature or murmurs makes tricuspid endocarditis a less likely diagnosis.

Transthoracic echocardiography may confirm an enlarged right ventricle, but the atrial septum is often difficult to visualise and for this reason trans-oesophageal echocardiography is usually more helpful. Right heart catheterisation will allow quantification of the degree of shunting and an assessment of whether the defect is suitable for closure. In this case, however, the clinical evidence of marked pulmonary hypertension suggests that it may be too late for this patient.

A V/Q scan

This would be used to examine for the presence of pulmonary emboli, which would be a less likely diagnosis here. Additionally, in the absence of contra-indications such as pregnancy or allergy to contrast media, a CTPA would be the preferred diagnostic test for PE.

C Arterial blood gas

While it may provide information about oxygenation, it would not be the most useful investigation in reaching a firm diagnosis or advising the next step in definitive management.

D Pulmonary function testing

While this might provide information regarding the presence (or not) of a restrictive or obstructive lung defect, this patient's symptoms are suggestive of cardiac disease. In addition, PFT would not be able to quantify the degree of pulmonary hypertension, which is a highly desirable piece of information here.

E High-resolution CT thorax

This patient's symptoms are suggestive of an ASD, in which case a right heart catheter would provide more diagnostic and prognostic information than a CT thorax would be able to provide.

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A 58-year-old man presents with central crushing chest pain radiating to his left arm. He has a long history of smoking and takes ramipril, aspirin and simvastatin for hypertension and dyslipidaemia. A few minutes after admission he deteriorates, with loss of consciousness. On examination his BP is 80/50 mmHg and the ECG monitor shows he is in VT. You arrange to cardiovert him. Post-cardioversion his BP recovers to 125/72 mmHg, and he receives aspirin and heparin.

Investigations:

Hb	12.9 g/dl
WCC	6.1 $x10^9$/l
PLT	310 $x10^9$/l
Na^+	139 mmol/l
K^+	5.2 mmol/l
Creatinine	120 μmol/l
Troponin	5.1 (<0.05)
ECG	Inferior ST elevation, pulse 75/min

Which one of the following represents the most appropriate management step?

A	IV streptokinase
B	IV alteplase
C	PCI
D	IV bretylium
E	IV magnesium

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Normal Values

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Which one of the following represents the most appropriate management step?

A IV streptokinase

B IV alteplase

C PCI

D IV bretylium

E IV magnesium

Explanation

C PCI

This man has suffered an acute inferior myocardial infarction and a period of ventricular tachycardia. As such, referral for urgent PCI to relieve ischaemia is the management of choice. Given the results of recent studies, PCI is almost always preferable to thrombolysis where available.

A IV streptokinase

Current guidelines are clear that primary PCI is the recommended reperfusion therapy over fibrinolysis if performed by an experienced team within 120 min of first medical contact. Nice guidelines state that fibrinolysis should be offered as primary treatment 'to people with acute STEMI presenting within 12 hours of onset of symptoms if primary PCI cannot be delivered within 120 minutes of the time when fibrinolysis could have been given'.

B IV alteplase

Current guidelines are clear that primary PCI is the recommended reperfusion therapy over fibrinolysis if performed by an experienced team within 120 min of first medical contact. Nice guidelines state that fibrinolysis should be offered as primary treatment 'to people with acute STEMI presenting within 12 hours of onset of symptoms if primary PCI cannot be delivered within 120 minutes of the time when fibrinolysis could have been given'.

D IV bretylium

Cardioversion is the management of choice for sustained VT and VF. Sustained monomorphic VT that is recurrent or refractory to direct current cardioversion should be considered to be treated with IV amiodarone in the first instance, and may be considered for treatment with IV lidocaine or sotalol (do not use IV sotalol or other beta-blockers in the context of a low ejection fraction).

E IV magnesium

Hypomagnesaemia may worsen the propensity to develop VT; as such, if there is reasonable suspicion of hypomagnesaemia such as a history of diarrhoea, IV magnesium replacement may be considered. However, we are not given such a history here and, as such, while it may prove advantageous, provision of IV magnesium should not delay access to definitive management, in this case PCI.

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External Links

Acute Myocardial Infarction in patients presenting with ST-segment elevation...
escardio.org/Guidelines/Clinical-Practice-Guidelines/Acute-Myocardial-Infarction-in-...

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A 42-year-old man with a history of asthma presents to the Emergency Room with palpitations and light-headedness. He has had two previous episodes of asthma which required admission to the Intensive Therapy Unit, and he is currently managed on salmeterol/fluticasone combination therapy 500/50 BD and salbutamol PRN.

On examination he has a pulse of 160/min, with a BP of 90/60 mmHg. There are bibasal crackles on auscultation of the chest. You try the Valsalva manoeuvre, which fails.

Investigations:

Hb	13.4 g/dl
WCC	5.7 $x10^9$/l
PLT	301 $x10^9$/l
Na^+	139 mmol/l
K^+	4.9 mmol/l
Creatinine	100 µmol/l
ECG	Supraventricular tachycardia, lateral ST depression

Which one of the following is the most appropriate option in this case?

A	IV sotalol
B	IV adenosine
C	DC cardioversion
D	IV verapamil
E	IV amiodarone

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Normal Values

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Which one of the following is the most appropriate option in this case?

A IV sotalol

B IV adenosine

C DC cardioversion

D IV verapamil

E IV amiodarone

Explanation

C DC cardioversion

This patient has an episode of paroxysmal SVT and is relatively decompensated, with a systolic of 90 mmHg and bilateral basal crackles. As such, electrical cardioversion is the most appropriate management option.

A IV sotalol

We are told this patient has a history of asthma, and thus beta blockade is contra-indicated here. We are also told he is relatively decompensated, and therefore electrical cardioversion is the most appropriate management strategy.

B IV adenosine

Adenosine can precipitate bronchoconstriction, and it is contra-indicated in chronic obstructive lung disease (including asthma).

D IV verapamil

This patient is decompensating, with a reduced BP and evidence of pulmonary congestion. While verapamil represents an appropriate choice for chemical cardioversion, the precarious nature of this patient's situation warrants an attempt at rapid cardioversion electrically.

E IV amiodarone

This patient is decompensating, with a reduced BP and evidence of pulmonary congestion. While IV amiodarone represents an appropriate choice for chemical cardioversion, the precarious nature of this patient's situation warrants an attempt at rapid cardioversion electrically. Alternatives to amiodarone include non-dihydropyridine calcium antagonists such as verapamil.

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A 54-year-old man presents to the Emergency Room with central crushing chest pain. He is a smoker of 40-50 cigarettes per day and suffers from hypertension for which he takes ramipril 10 mg daily. He also uses aspirin 75 mg/day and atorvastatin 10 mg. On examination his BP is 90/60 mmHg, with pulse 105/min. He is in gross left ventricular failure and has cool peripheries. His ECG reveals inferior T-wave inversion.

From the options given below, which parameter fits most closely with the clinical history given?

A	Right atrial pressure 6 mmHg
B	Cardiac index 1.8 l/min/m^2
C	Cardiac index 2.9 l/min/m^2
D	Mean arterial pressure 105 mmHg
E	Ejection fraction 54%

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Calculator

Normal Values

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D	Mean arterial pressure 105 mmHg
E	Ejection fraction 54%

Explanation

B	Cardiac index 1.8 l/min/m^2

This man is in cardiogenic shock and it is therefore to be expected that his cardiac index would be below 2 l/min/m^2. Cardiac index relates cardiac output to body surface area and is calculated by CO/BSA. Normal range is approximately 2.5-4.0 l/min/m^2. Management in this situation would involve inotropic support with an agent such as dobutamine, and ideally mechanical support with the insertion of an intra-aortic balloon pump (IABP).

A	Right atrial pressure 6 mmHg

We would expect there to be back pressure, consistent with his pulmonary oedema, leading to significantly elevated RAP. Six is a normal reading, and would be unexpectedly low in the case of such a patient.

C	Cardiac index 2.9 l/min/m^2

This patient is in cardiogenic shock and we would therefore expect his cardiac index to be below 2.

D	Mean arterial pressure 105 mmHg

Given that we are told his BP is 90/60, a mean arterial pressure of 105 would be impossibly high. The equation for MAP is [SBP + (2 × DBP)]/3 (in this case, 70).

E	Ejection fraction 54%

In the face of such a degree of cardiogenic shock, an ejection fraction of 54% would be unexpectedly high.

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A 45-year-old smoker presents to the rapid access clinic with a 3-month history of chest pains on exertion. These have been increasing in frequency over the last 3 weeks. He has no past medical history and is on no medications. On arrival he has a blood pressure of 156/97 mmHg and a heart rate of 89/min. Examination reveals no abnormality. The resting electrocardiogram (ECG) shows normal sinus rhythm with no evidence of left ventricular hypertrophy.

Investigations:

Hb	13.6 g/dl
WCC	4.6×10^9/l
PLT	208×10^9/l
Na^+	138 mmol/l
K^+	4.9 mmol/l
Creatinine	83 mol/l
Urea	5.1 mmol/l
Cholesterol	6.4 mmol/l
Glucose	4.8 mmol/l

Which one of the following is the most important intervention to perform next?

A	Antihypertensive therapy with an ACE inhibitor
B	Trial of GTN spray
C	Initiation of statin therapy
D	ETT
E	Myocardial SPECT perfusion scan

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Calculator

Normal Values

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D	ETT
E	Myocardial SPECT perfusion scan

Explanation

E Myocardial SPECT perfusion scan

This patient has symptoms suggestive of ischaemic heart disease. In the context of risk factors for ischaemic heart disease (hypertension, hypercholesterolaemia, smoking), the clinical diagnosis should be confirmed with non-invasive functional scanning such as myocardial perfusion scanning with SPECT. Any concomitant risk factors, such as hypertension or dyslipidaemia, should also be aggressively managed and he should be strongly encouraged to stop smoking.

A Antihypertensive therapy with an ACE inhibitor

While it is important to aggressively manage risk factors in this patient, and he should certainly be started on antihypertensive therapy, it would not aid in diagnosing the aetiology of his symptoms, and does not represent the *most* important next step.

B Trial of GTN spray

While it would prove prudent to provide a GTN spray for symptom control, doing so would not aid in the diagnosis of the underlying cause of the patient's symptoms and would not represent the *most* appropriate next step in his care.

C Initiation of statin therapy

While it is important to aggressively manage risk factors in this patient, and he would likely benefit from being started on started on statin therapy, it is not the *most* important next step.

D ETT

According to current NICE guidance, exercise ECG is recommended as the initial test for establishing a diagnosis of SCAD in patients with symptoms of angina and intermediate pre-test probability of CAD (15–65%), free of anti-ischaemic drugs, unless they cannot exercise or display ECG changes which make the ECG non-evaluable. However, an imaging stress test is recommended as the initial test for diagnosing SCAD if the PTP is between 66–85% or if LVEF is <50% in patients without typical angina. The guidance is clear that stress imaging is recommended as the initial test option if local expertise and availability permit.

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External Links

Stable Coronary Artery Disease (Management of)
escardio.org/Guidelines/Clinical-Practice-Guidelines/Stable-Coronary-Artery-Disease...

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An 82-year-old male is seen in the cardiology clinic with a history of dizzy spells on exertion. There is no history of associated chest pain or palpitations. He describes a couple of episodes when he felt as if he was going to pass out. He has a previous history of hypertension, for which he is treated by his general practitioner (GP) with bendrofluazide. On arrival his blood pressure is measured at 146/86 mmHg and his heart rate is 65 beats/min. Clinical examination reveals a soft systolic murmur over the aortic area, with no radiation. His resting electrocardiogram (ECG) shows sinus rhythm with a PR interval of 0.24 ms. Routine blood tests including thyroid function tests are normal. A 24 h tape is arranged.

Which of the following results would be an indication for a permanent pacemaker?

A	PR interval 260 ms
B	Paroxysmal AF with pauses of 2 s
C	Episodes of asymptomatic Wenckebach rhythm
D	Episodes of sinus pauses lasting 2.5 s
E	Episodes of asymptomatic type 2 second-degree block

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Calculator

Normal Values

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E	Episodes of asymptomatic type 2 second-degree block

Explanation

E	Episodes of asymptomatic type 2 second-degree block

Indications for permanent pacemaker implantation include third-degree block, symptomatic Wenckebach phenomenon, asymptomatic type II second-degree block and pauses of >3.0 s. Asymptomatic Mobitz type II second-degree block is an indication because it is likely to progress to complete heart block and/or lead to episodes of syncope. Operative complications include lead displacement, haematomas, infection and, rarely, erosion of the pacemaker box through the skin. Occasionally patients may present with failure of the impulse to capture and symptomatic bradycardia. Often reprogramming alone may be adequate to prevent further problems.

A	PR interval 260 ms

In the absence of haemodynamic compromise, 1st-degree heart block does not require specific intervention.

B	Paroxysmal AF with pauses of 2 s

Pauses lasting 3 s or longer represent an indication for pacing.

C	Episodes of asymptomatic Wenckebach rhythm

Symptomatic Wenckeback would be an indication for pacemaker insertion.

D	Episodes of sinus pauses lasting 2.5 s

Pauses lasting 3 s or longer represent an indication for pacing.

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A 59-year-old lady attends the Emergency Department complaining of severe indigestion-like pain. An electrocardiogram (ECG) shows ST elevation in the inferior leads. The patient goes for emergency PCI and is then admitted for monitoring in the coronary care unit. An hour after PCI she is noted to have a bradycardia that does not respond to atropine. Her blood pressure is around 100 mmHg systolic.

Which one of the following would be an indication for temporary pacing wire insertion?

A	Ventricular rate of 43 bpm
B	Type 1, second-degree heart block
C	Frequent ventricular ectopics
D	Junctional rhythm with a QRS of 160 ms
E	First-degree heart block with a PR of 240 ms

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E	First-degree heart block with a PR of 240 ms

Explanation

D	Junctional rhythm with a QRS of 160 ms

A widening QRS indicates a more extensive ischaemic territory affecting the conducting bundles. Temporary pacing wire insertion can be used as a holding measure to allow the myocardium time to recover. Bradycardias/heart block in the context of anterior myocardial infarction carry a much greater prognostic significance and are an indicator of extensive infarction.

A	Ventricular rate of 43 bpm

Bradycardias are quite common in the context of inferior myocardial infarctions and they are not considered to be of any prognostic significance. This is because the right coronary artery, which is the commonest culprit artery in inferior myocardial infarctions, also gives branches to the sinoatrial (SA) and atrioventricular (AV) nodes. In the absence of haemodynamic compromise, no specific intervention would be required.

B	Type 1, second-degree heart block

Asymptomatic patients with Wenckeback phenomenon do not usually require intervention, as this rhythm is at lower risk of progression to complete heart block than type 2, second-degree heart block. Symptomatic patients can be treated with atropine, and in some cases pacing.

C	Frequent ventricular ectopics

Ectopics are common following MI, and may represent reperfusion rhythm. In the absence of haemodynamic compromise, no specific intervention would be required. The CAST trial examined suppression of ventricular ectopics with class 1 anti-arrhythmics following MI, but was stopped early due to evidence of harm.

E	First-degree heart block with a PR of 240 ms

First-degree heart block does not require specific intervention apart from observation.

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A 74-year-old male presents to his general practitioner (GP) with symptoms of breathlessness on climbing up stairs over the last 6 months. There is no history of chest pain or palpitations. He is known to suffer from hypertension for which he is on amlodipine 5 mg once daily. He is a smoker with a 40-pack year history and is obese with a BMI of 32. Blood pressure in the surgery is 155/85 mmHg, pulse is 80/min and regular. The GP can hear a quiet systolic murmur. His resting electrocardiogram (ECG) shows evidence of left ventricular hypertrophy. The GP refers the patient to the cardiology open-access echocardiography service.

Which of the following echo findings would most strongly point towards a non-cardiac cause of his breathlessness?

A	Left ventricular hypertrophy
B	Right ventricular impairment
C	Moderate aortic stenosis
D	Hypokinetic anterior wall of the left ventricle
E	Moderate mitral regurgitation

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A	Left ventricular hypertrophy
B	Right ventricular impairment
C	Moderate aortic stenosis
D	Hypokinetic anterior wall of the left ventricle
E	Moderate mitral regurgitation

Explanation

B	Right ventricular impairment

The story is suggestive of early onset heart failure. The picture of right ventricular dysfunction should raise the possibility of an underlying respiratory pathology. In someone with a heavy smoking history, this is most likely to be chronic obstructive airways disease leading to chronic hypoxia and pulmonary hypertension; however, chronic thromboembolic disease is another possibility. If right ventricular impairment is demonstrated, given his BMI, CT pulmonary angiography (CTPA) or V/Q scan could be considered.

A	Left ventricular hypertrophy

Given his raised BP despite anti-hypertensive medication, this would suggest the possibility of uncontrolled hypertension as a potential cause of early-onset heart failure, explaining his breathlessness.

C	Moderate aortic stenosis

This would point towards valvular disease as a cause of his breathlessness.

D	Hypokinetic anterior wall of the left ventricle

This would suggest possible previous MI/IHD as a possible cardiac cause of his breathlessness.

E	Moderate mitral regurgitation

This would point towards valvular disease as a cause of his breathlessness.

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A 45-year-old lady attends the emergency department complaining of palpitations. She describes these as fast and regular, of sudden onset and termination. They have been present for a number of years but she feels they have become more frequent following a chest infection a week ago for which she is on antibiotics from her general practitioner (GP). She has a past medical history of bipolar affective disorder for which she is on treatment. On examination in the Emergency department her BP is 142/72 mmHg, pulse is 70/min and regular. Her chest is clear. Electrolytes reveal that her potassium is in the normal range (3.9 mmol/l).

A resting 12-lead electrocardiogram (ECG) shows a QTc interval of 0.50 s. A 72hr holter monitor is arranged which demonstrates a number of short runs of SVT corresponding to the patient's symptoms.

Which of the following agents can be used safely in this case?

A	Sotalol
B	Bisoprolol
C	Procainamide
D	Amiodarone
E	Disopyramide

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A	Sotalol
B	Bisoprolol
C	Procainamide
D	Amiodarone
E	Disopyramide

Explanation

The answer is Bisoprolol -

A beta-blocker such as bisoprolol can be used for suppression of arrhythmias in this case as it does not have an effect on the QT interval. In contrast other agents such as amiodarone are known to prolong the QT interval; this actually increases the risk of torsades de pointes ventricular tachycardia and as such should be avoided. With an ECG showing long QT, she should be given advice to avoid other agents which are known to prolong QT such as macrolide antibiotics. Additionally, care should be taken to keep both her potassium and magnesium in the normal range if possible.

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A 63-year-old male presents to the Emergency Department with a 3 h history of central crushing chest pain. His ECG on arrival shows ST elevation of 3 mm in the anterior leads consistent with an anterior myocardial infarction. He is sent for primary PCI and recovers well after angioplasty and stenting, being discharged from hospital some 5 days later. Two months following discharge from hospital the same patient presents to hospital complaining of palpitations and dizziness. An ECG shows a broad complex tachycardia. Following emergency treatment with synchronised DC cardioversion, an echocardiogram is performed that shows a hypokinetic anterior wall with an EF of 30%.

Which one of the following is the treatment of choice?

A	Amiodarone 200 mg tds
B	Automated ICD
C	Mexiletine 200 mg OD
D	Amiodarone 200 mg OD
E	Sotalol 80 mg OD

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B	Automated ICD
C	Mexiletine 200 mg OD
D	Amiodarone 200 mg OD
E	Sotalol 80 mg OD

Explanation

B	Automated ICD

The development of late-onset ventricular tachycardia following an ischaemic event, coupled with the finding of left ventricular impairment on the echocardiogram, is an indication for the implantation of an automated defibrillator. Studies have demonstrated that this is a superior strategy with respect to survival versus long-term anti-arrhythmic therapy with an agent such as amiodarone or the other options listed. MADIT-II showed a reduction in all-cause mortality with ICD implantation vs conventional medical therapy (14.2% vs. 19.8%) in the context of post-MI patients with HFrEF. This was almost completely attributable to a reduction in sudden cardiac death (3.8% vs. 10.0%).

A	Amiodarone 200 mg tds

Studies show that, in the context of ventricular tachyarrhythmias following MI in patients with decreased LV function, patients do significantly better with ICD implantation than with amiodarone.

C	Mexiletine 200 mg OD

Mexiletine is a class 1B anti-arrhythmic agent. It is no longer licensed in the UK and therefore not an appropriate choice in this case.

D	Amiodarone 200 mg OD

Studies show that, in the context of ventricular tachyarrhythmias following MI in patients with decreased LV function, patients do significantly better with ICD implantation than with amiodarone.

E	Sotalol 80 mg OD

Studies show that in the context of VT following MI, in patients with heart failure, ICD is the management of choice

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External Links

Electrophysiologically guided amiodarone therapy versus the implantable car...
ncbi.nlm.nih.gov/pubmed/12039497

Analysis of mortality events in MADIT-II
ncbi.nlm.nih.gov/pubmed?term=15093884

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A 27-year-old woman who is 24 weeks into her first pregnancy is referred by her general practitioner (GP) to the cardiology department complaining of palpitations. There is no past medical history of note and she is on no medications. On examination her BP is 115/82 mmHg, pulse is 70/min and regular, there is a systolic murmur and a fixed splitting of the second heart sound. Her 12-lead electrocardiogram (ECG) shows left-axis deviation with a right bundle branch block. An echocardiogram is performed which shows an ostium primum atrial septal defect.

What is the risk, if any, to the pregnancy?

A	No significant increase in risk compared to the general population
B	Small risk to the mother, up to 20% risk of CHD to the foetus
C	Significant risk of maternal mortality, up to 40%
D	No significant increase in risk to the mother, up to 40% risk of CHD to the foetus
E	10% risk of maternal mortality, no increased risk to the foetus

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E	10% risk of maternal mortality, no increased risk to the foetus

Explanation

A	No significant increase in risk compared to the general population

Atrial septal defects are usually well tolerated, as pulmonary hypertension is not usually present at childbearing age. However, the defect should be closed prior to subsequent pregnancies. In the presence of Eisenmenger syndrome the maternal mortality is approximately 40% and pregnancy is contraindicated, with older maternal age increasing the risk of pulmonary hypertension and Eisenmenger. Systolic flow murmurs are common in pregnancy; in the absence of structural heart disease they do not hold any prognostic significance.

B	Small risk to the mother, up to 20% risk of CHD to the foetus

Pregnancy is tolerated well by most women with ASD. Most cases of ASD are sporadic, and the risk to the foetus would not be expected to be as high as 20%.

C	Significant risk of maternal mortality, up to 40%

ASD is well tolerated in pregnancy by most women. Such a high maternal mortality (30–50% in older series and 17–33% in more recent studies) is seen in women with severe PAH, and in Eisenmenger syndrome.

D	No significant increase in risk to the mother, up to 40% risk of CHD to the foetus

Most cases of ASD are sporadic, and the risk to the foetus would not be expected to be as high as 40%.

E	10% risk of maternal mortality, no increased risk to the foetus

Pregnancy is tolerated well by most women with ASD.

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A 45-year-old woman presents with breathlessness and palpitations. On examination there is a left parasternal heave. She has no murmurs and her chest is clear. The resting ECG shows atrial fibrillation with right axis deviation. An echocardiogram confirms dilated right heart chambers.

The following data are collected during a left and right heart catheterisation study:

Sample site	Oxygen saturations (%)
Inferior vena cava	62
Superior vena cava	58
Right atrium	78
Right ventricle	79
Pulmonary artery	80
Arterial saturation	98

Which of the following is the most likely diagnosis?

A	Atrial septal defect
B	Ventricular septal defect
C	Patient ductus arteriosus
D	Ebstein's anomaly
E	Pulmonary stenosis

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Which of the following is the most likely diagnosis?

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B Ventricular septal defect

C Patient ductus arteriosus

D Ebstein's anomaly

E Pulmonary stenosis

Explanation

A Atrial septal defect

The findings of a parasternal heave on examination in combination with the right axis deviation are consistent with right ventricular volume overload. The cardiac catheterisation data show a step-up in oxygen saturations at the level of the right atrium. This signifies the presence of a left-to-right shunt at the level of the atrium, making an atrial septal defect the most likely diagnosis. The patient should be cardioverted to sinus rhythm prior to any intervention, to close the atrial septal defect. A transoesophageal echocardiogram can give sufficient anatomical data as to the size and site of the defect. It is well worth patients undergoing electrophysiological studies prior to any closure procedure. These are far easier to perform while the defect is present, as they provide an easy route into the left atrium. Any abnormal pathways predisposing to atrial flutter/fibrillation should be considered for radiofrequency ablation, which can be curative.

B Ventricular septal defect

The cardiac catheterisation data show a step-up in saturations at the level of the right atrium, making an ASD a more likely diagnosis than a VSD (in which case such a step-up would not be seen until the level of the right ventricle).

C Patient ductus arteriosus

PDA is often associated with a conspicuous apex beat due to left venticular hypertrophy, and a continuous murmur classically described as 'machinery like'.

D Ebstein's anomaly

This is a rare congenital condition which is characterised by 'atrialisation' of the right ventricle due to apical displacement of the tricuspid valve. The first heart sound is widely split due to delayed closure of the tricuspid valve. S2 is usually normal, but may be widely split when P2 is delayed due to right bundle-branch block. A pansystolic tricuspid regurgitation murmur is also common. Patients may present with cyanosis and clubbing.

E Pulmonary stenosis

For stenosis to be sufficiently severe that a patient would present with symptoms, this would typically be associated with a loud pulmonary ejection murmur - loudest at the pulmonary area - with radiation to the left shoulder.

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A 25-year-old male presents to the Emergency Department complaining of central chest pain which is made worse by coughing and deep inspiration. On examination, he has low-grade pyrexia at 37.9°C. A friction rub is heard over the left sternal edge and his chest is clear. A 12-lead ECG shows widespread saddle-shaped ST changes. CXR is unremarkable. A blood sample is sent for D-dimer analysis and is reported as negative. A bedside echocardiogram does not detect any significant abnormality.

What is the most likely diagnosis?

A	Lower respiratory tract infection
B	Myocardial infarction
C	Pulmonary embolism
D	Atypical pneumonia
E	Pericarditis

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What is the most likely diagnosis?

A	Lower respiratory tract infection
B	Myocardial infarction
C	Pulmonary embolism
D	Atypical pneumonia
E	Pericarditis

Explanation

E	Pericarditis

This patient presents with symptoms and signs consistent with a diagnosis of acute pericarditis. The diagnosis can be made based on the triad of chest pain, pericardial friction rub and ECG changes. A common complication of pericarditis is the development of pericardial effusion. This can present as breathlessness. An echocardiogram is used to confirm this and look for evidence of haemodynamic compromise. High dose aspirin or non-steroidal anti-inflammatories is the treatment of choice. A number of viruses including Coxsackie B, mumps and influenza are recognised as possible causes.

A	Lower respiratory tract infection

Clear chest on examination, the presence of a pericardial rub and the ECG changes seen make this a less likely diagnosis than pericarditis. For an LRTI significant enough to cause symptoms, one would expect a degree of change on the CXR.

B	Myocardial infarction

The pleuritic nature of his chest pain and the widespread nature of his ECG changes make this a less likely diagnosis in this case. Typically, one would expect ECG changes such as ST elevation or depression in the area served by a given coronary territory.

C	Pulmonary embolism

The negative D-dimer result makes this diagnosis significantly less likely than the other options here.

D	Atypical pneumonia

One would expect findings on chest examination, or CXR, to support this diagnosis.

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A 73-year-old female who is known to suffer from peptic ulcer disease presents to the Emergency Department complaining of a 6 h history of epigastric pain. She initially felt this was a bout of severe indigestion but called an ambulance after she started becoming short of breath. On arrival in the department her blood pressure is 100/60 mmHg, heart rate 120/min and she appears clammy and sweaty. Her heart sounds are normal and there are some basal crackles on auscultation of her chest. A 12-lead electrocardiogram (ECG) shows ST elevation of 1 mm in leads I and aVL, with ST depression of 2 mm and a dominant R wave in leads V1–V3. She undergoes urgent primary PCI and makes a good initial recovery. One week later she re-attends complaining of severe retrosternal chest pain that is worse on inspiration. On examination she is found to have a low-grade pyrexia. There is a rub on auscultation of her chest. A 12-lead ECG shows dominant R waves in leads V1-V3. A chest X-ray shows cardiomegaly with a small left-sided pleural effusion.

Which of the following is the most likely diagnosis?

A	Posterior myocardial infarction
B	Viral infection
C	Dressler syndrome
D	Bacterial lower respiratory tract infection
E	Pulmonary embolism

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Which of the following is the most likely diagnosis?

A	Posterior myocardial infarction
B	Viral infection
C	Dressler syndrome
D	Bacterial lower respiratory tract infection
E	Pulmonary embolism

Explanation

C Dressler syndrome

Dressler syndrome usually occurs 1–6 weeks after a myocardial infarction and is characterised by fever, pleuritis and pericarditis. It is thought to be an autoimmune reaction to myocardial antigens released after the infarction. Management is with aspirin, and corticosteroids are used in resistant cases, particularly those where pericardiocentesis has been required for drainage of pericardial effusion; in rare cases up to 1500 ml of fluid is recognised to accumulate in the pericardial sac. Other post-MI syndromes include papillary muscle rupture, with a median time to onset of 13 h, which leads to acute mitral regurgitation, and ventricular septal defect, occurring with an incidence of 0.2% post-infarct, leading to catastrophic heart failure.

A Posterior myocardial infarction

The pleuritic nature of her chest pain, in the context of a recent MI, and the absence of dynamic ST changes on her ECG, make this a less likely diagnosis than Dressler syndrome.

B Viral infection

We are given a history of only a mild pyrexia, and in the context of a recent MI this would be a less likely diagnosis than Dressler syndrome. It is important to remember, however, that viral infections (particularly Coxsackie) can cause pericarditis.

D Bacterial lower respiratory tract infection

We are not given a significant history of respiratory symptoms such as productive cough, and the CXR was not overtly suspicious for LRTI (though in some cases of LRTI, parapneumonic effusions can be seen). Particularly in the context of recent MI, this makes LRTI a less likely diagnosis than Dressler syndrome.

E Pulmonary embolism

The presence of a rub, and a pleural effusion, in the context of a recent MI, make this a less likely diagnosis than Dressler syndrome.

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A 21-year-old student presents to the Emergency Department complaining of palpitations. These started suddenly an hour ago and she describes them as fast and irregular. She has had a couple of short-lived episodes in the past but she has not sought medical advice about them. On examination she is found to have a blood pressure of 105/65 mmHg and a heart rate of 170 beats/min. A 12-lead ECG shows a supraventricular tachycardia with randomly changing QRS width. She is cardioverted and suspected to have Wolff -Parkinson-White syndrome.

Which of the following is the most appropriate long-term management option?

A	Amiodarone
B	Flecainide
C	Mexiletine
D	Bisoprolol
E	Radiofrequency ablation

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Which of the following is the most appropriate long-term management option?

A	Amiodarone
B	Flecainide
C	Mexiletine
D	Bisoprolol
E	Radiofrequency ablation

Explanation

E	Radiofrequency ablation

The best long-term management option for Wolff–Parkinson–White (WPW) syndrome patients is referral for electrophysiological studies and radiofrequency ablation of the accessory pathway. This can be a curative procedure and is therefore preferable to a lifetime of anti-arrhythmic therapy. Out of the medical options given, amiodarone and flecanide have a significant body of evidence in prophylaxis against atrial fibrillation in WPW. Sotalol is another agent that prolongs myocardial refractiveness and may be used in some patients.

A	Amiodarone

While amiodarone is a suitable pharmacological option, radiofrequency ablation represents a potentially curative procedure and represents the best long-term management option, particularly given this patient's young age.

B	Flecainide

While flecainide is a suitable pharmacological option, radiofrequency ablation offers a potentially curative procedure and represents the best long-term management option, particularly given this patient's young age.

C	Mexiletine

It is a class 1b anti-arrythmic which is not currently licensed, but can be obtained from 'special-order' manufacturers and used for life-threatening ventricular arrhythmias.

D	Bisoprolol

Drugs which act primarily on the AV node, such as verapamil and adenosine, should be avoided as these may lead to preferential conduction down the accessory pathway and precipitate VF.

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A 46-year-old lady is diagnosed with a large left breast carcinoma. She is seen by the multidisciplinary oncology team who advocate a mastectomy with adjuvant radiotherapy and chemotherapy. A preoperative echocardiogram is performed and is reported as showing a good left ventricle with no significant valvular disease. The patient has a successful operation. The tumour is reported as HER2-positive, and the patient is started on a chemotherapy regime. Two months later she complains of a gradual decrease in her exercise tolerance. On examination there is mild bipedal oedema. Auscultation reveals inspiratory crackles at the bases of the lungs with reduced air entry on the side of the mastectomy. A chest X-ray shows a small unilateral pleural effusion.

Which of the following is the most appropriate next step?

A	Therapeutic drainage of the effusion
B	Conservative management with radiographic follow-up
C	Repeat echocardiogram
D	CT chest
E	Full-body PET

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A 46-year-old lady is diagnosed with a large left breast carcinoma. She is seen by the multidisciplinary oncology team who advocate a mastectomy with adjuvant radiotherapy and chemotherapy. A preoperative echocardiogram is performed and is reported as showing a good left ventricle with no significant valvular disease. The patient has a successful operation. The tumour is reported as HER2-positive, and the patient is started on a chemotherapy regime. Two months later she complains of a gradual decrease in her exercise tolerance. On examination there is mild bipedal oedema. Auscultation reveals inspiratory crackles at the bases of the lungs with reduced air entry on the side of the mastectomy. A chest X-ray shows a small unilateral pleural effusion.

Which of the following is the most appropriate next step?

A	Therapeutic drainage of the effusion
B	Conservative management with radiographic follow-up
C	Repeat echocardiogram
D	CT chest
E	Full-body PET

Explanation

C	Repeat echocardiogram

The development of symptoms and signs of cardiac failure in an oncology patient should raise the possibility of cardiomyopathy secondary to cardiotoxic chemotherapy. A baseline echocardiogram should ideally be performed prior to embarking on any course of chemotherapy, and repeat echocardiograms are indicated if the patient develops symptoms during or after the course of chemotherapy. Herceptin in particular is recognised as being associated with cardiomyopathy. Animal studies have suggested that agonism of the Erb-B2 (HER2) receptor is protective against the development of dilated cardiomyopathy; as such, antagonism may increase the risk of developing the condition. Additionally, there can be negative synergy between trastuzumab and other chemotherapeutic agents used to treat breast cancer, including anthracyclines such as doxorubicin, putting patients at increased risk of cardiotoxicity.

A	Therapeutic drainage of the effusion

We are told that the effusion is small and unilateral. It is less likely to be responsible for this patient's symptoms than cardiac toxicity from her chemotherapy regime.

B	Conservative management with radiographic follow-up

We are told that the effusion is small and unilateral. It is less likely to be responsible for this patient's symptoms than cardiac toxicity from her chemotherapy regime. It would seem prudent to actively investigate and treat this.

D	CT chest

his would prove a less diagnostically useful investigation in the first instance than an echocardiogram, particularly given that there is a baseline echo with which it can be compared.

E	Full-body PET

This would prove a less diagnostically useful investigation in the first instance than an echocardiogram, particularly given that there is a baseline echo with which it can be compared.

32344

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A 23-year-old woman presents with worsening shortness of breath. Past medical history of note includes laparoscopic appendicectomy 3 years earlier, complicated by intra-abdominal haemorrhage, laparatomy, multiple organ failure and numerous central venous catheterisations. She has suffered multiple admissions over the past 2 years for cardiac failure and has been noted to have pulmonary hypertension on echocardiogram. On examination she is apyrexial, BP 162/90 mmHg, pulse 90/min. A murmur is heard over the left groin.

Investigations:

Right atrial pressure	15 mmHg
Saturation	91% in IVC
Mean pulmonary artery pressure	38 mmHg

What is the most likely underlying cause?

A	Congenital AV malformation
B	Patent ductus arteriosus
C	ASD
D	Iatrogenic AV fistula
E	Angiosarcoma

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E	Angiosarcoma

Explanation

Repeated central venous catheterisation is a rare cause of iatrogenic AV fistula. This woman has had several attempted central venous catheterisations including potentially via the groin, which has led to a fistula between the IVC and the iliac artery, with the consequence that right sided circulatory pressures are significantly increased. The treatment of choice is stent repair of the iliac artery which is likely to lead to resolution of her symptoms. Significantly raised right sided cardiac pressures are also seen as a natural rather than iatrogenic phenomenon in patients with significant arterio-venous malformations.

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A 73-year-old man presents to his general practitioner (GP) with shortness of breath on exertion. This has been getting progressively worse over the last 6 months. He has found that he has to prop himself up with three pillows to go to sleep and there have been a couple of occasions when he woke up in the middle of the night with shortness of breath. He denies any history of chest pain or palpitations. There is no past medical history and he is on no medications. On examination his blood pressure is 168/105 mmHg and his heart rate is 85/min. There is a pansystolic murmur on auscultation of his heart and bi-basal crackles on auscultation of his chest. There is bipedal oedema around his ankles.

Which of the following findings, if present, would be associated with the worst prognosis in this case?

A	Cardiomegaly on chest X-ray
B	Mitral regurgitation on echo
C	Ejection fraction of 50% on echo
D	Left ventricular hypertrophy on ECG
E	Serum sodium of 129 mmol/l

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C	Ejection fraction of 50% on echo
D	Left ventricular hypertrophy on ECG
E	Serum sodium of 129 mmol/l

Explanation

E	Serum sodium of 129 mmol/l

This patient presents with symptoms and signs of congestive cardiac failure. Given the history, the most likely cause for this is left ventricular failure secondary to hypertension. Non-iatrogenic hyponatraemia in the context of congestive cardiac failure carries a poor prognosis as it is secondary to significant fluid overload. It was thought that specific vasopressin antagonists may offer a significant prognostic advantage in patients with heart failure and marked hyponatraemia, but the data so far have proved very disappointing.

A	Cardiomegaly on chest X-ray

This patient is markedly hypertensive on presentation, and it could be surmised that this is long-standing and uncontrolled. In this context, cardiomegaly is not an unexpected finding.

B	Mitral regurgitation on echo

This is the most common form of valvular heart disease in developed countries, and while it would be important to quantify and monitor, it is not the most prognostically adverse feature here.

C	Ejection fraction of 50% on echo

This is at the lower end of the normal range, and would not represent the most prognostically adverse finding here.

D	Left ventricular hypertrophy on ECG

This patient is markedly hypertensive on presentation, and it could be surmised that this is long-standing and uncontrolled. In this context, LVH is not an unexpected finding.

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A 55-year-old lorry driver presents to hospital with central chest pain. He describes this as a feeling of pressure on his chest that is building up in intensity. On arrival in the Emergency Department he looks sweaty and clammy and he vomits once in the resuscitation area. A 12-lead ECG shows ST elevation in the anterior leads, confirming an anterior myocardial infarction. He is transferred for urgent PCI and then moved to the coronary care unit.

Which of the following rhythms on an ECG taken 2 h post-PCI would be associated with the worst prognosis?

A	Multiple ventricular ectopics
B	Accelerated idioventricular rhythm
C	Third-degree atrioventricular block
D	Mobitz type 1 AV block (Wenckeback phenomenon)
E	Sinus rhythm with rate 30 bpm

Explanation

C Third-degree atrioventricular block

Complete heart block in the context of an anterior myocardial infarction signifies an extensive area of infarction and carries a high risk of in-hospital death. It is an indication for temporary pacing, and permanent pacing is almost invariably required. The CARISMA trial monitored patients with acute anterior myocardial infarction and reduced ejection fraction, and found that high-degree AV block was the strongest predictor of mortality. Note this is not the same study as the CHARISMA trial, which examined the effect of clopidogrel and aspirin in combination on cardiovascular events.

A Multiple ventricular ectopics

These can be related to reperfusion and are common in the context of acute MI. The CAST trial demonstrated evidence of harm in attempting to suppress ventricular ectopics with class 1 anti-arrhythmics following MI.

B Accelerated idioventricular rhythm

This is a common rhythm abnormality following MI, occurring in 15-20% of patients. Observation is key, and no treatment is usually needed.

D Mobitz type 1 AV block (Wenckeback phenomenon)

This is a relatively common rhythm abnormality following MI, occurring in up to 10% of patients, particularly in cases of inferior MI. It is usually benign, requiring only close observation to ensure that it does not progress to a higher-degree block.

E Sinus rhythm with rate 30 bpm

Sinus bradycardia is relatively common following MI, and may be due to drugs, ischaemia or a vagal response. Atropine can be used for symptomatic patients, with insertion of a temporary pacing line if this proves ineffective.

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External Links

CARISMA study
circ.ahajournals.org/content/122/13/1258.full.pdf

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A 25-year-old woman who has recently arrived in the UK presents to her general practitioner (GP) complaining of intermittent episodes of breathlessness associated with palpitations. She describes these as fast and irregular, and of sudden onset and termination. There is no associated chest pain but she has felt dizzy on a couple of occasions. On examination she has a blood pressure of 125/78 mmHg and a heart rate of 86/min. There is a diastolic murmur over the apex of the heart and the lungs are clear. A 12-lead electrocardiogram (ECG) shows sinus rhythm with bifid P waves.

Which of the following agents is the most appropriate in this case?

A	Bisoprolol
B	Digoxin
C	Amiodarone
D	Flecainide
E	Mexiletine

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Which of the following agents is the most appropriate in this case?

A	Bisoprolol
B	Digoxin
C	Amiodarone
D	Flecainide
E	Mexiletine

Explanation

A	Bisoprolol

The finding of a diastolic murmur combined with the presence of a bifid P wave (P-mitrale) on the electrocardiogram (ECG) points towards the diagnosis of mitral stenosis. The episodes of palpitations most likely represent episodes of paroxysmal atrial fibrillation (AF). A beta-blocker can be used as first-line treatment to prevent atrial tachy-arrhythmias, and slow down the heart rate in sinus rhythm, thus increasing diastolic time and augmenting cardiac output. Digoxin is not particularly helpful in paroxysmal AF, and amiodarone should be reserved for resistant cases.

B	Digoxin

It is not an agent recommended for paroxysmal AF. There is evidence that it does not prevent paroxysmal attacks, and may even prolong attacks when they occur.

C	Amiodarone

This (or dronedarone) would be indicated in cases of beta-blocker failure/resistant cases, assuming the patient meets the NICE criteria for its use.

D	Flecainide

It is contraindicated in cases of structural heart disease, such as the mitral stenosis suggested in this case. NICE guidelines state its use should be reserved for people with no evidence of structural or ischaemic heart disease.

E	Mexiletine

It is a class 1b anti-arrhythmic, which is unlicensed in the UK but available on special order for cases of life-threatening ventricular arrhythmia.

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External Links

NICE - Atrial fibrillation: management
nice.org.uk/guidance/cg180/resources/atrial-fibrillation-management-35109805981381

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A 35-year-old African-Caribbean male presents to his general practitioner (GP) with a history of palpitations. These occur randomly at rest but there have been episodes of fast palpitations on exertion associated with dizzy spells. He has had one episode of collapse after a game of squash. On examination there is a prominent apical impulse. A systolic murmur is heard over the left sternal edge on auscultation of the heart and the chest is clear. An echo reveals septal hypertrophy with a left ventricular outflow gradient of 55 mmHg, consistent with hypertrophic obstructive cardiomyopathy. A 72 h Holter monitor reveals episodes of non-sustained ventricular tachycardia.

Which of the following is most appropriate for managing his rhythm disturbance?

A	Metoprolol
B	Verapamil
C	Digoxin
D	Amiodarone
E	Implantable cardioverter defibrillator

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Normal Values

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Which of the following is most appropriate for managing his rhythm disturbance?

A	Metoprolol
B	Verapamil
C	Digoxin
D	Amiodarone
E	Implantable cardioverter defibrillator

Explanation

E	Implantable cardioverter defibrillator

This man has already suffered one episode of syncope, and has documented non-sustained VT on his 72 h Holter monitor. In the context of HOCM, he is at significant risk of sudden cardiac death related to VT, with an odds ratio of 4.35, and as such an implantable cardioverter defibrillator is the management of choice. Small studies in those with HOCM and VT show that ICDs have a positive impact on reducing the risk of sudden death.

A	Metoprolol

There are no randomised, controlled data to support the use of anti-arrhythmics for the prevention of SCD in HCM. Beta-blockers and/or amiodarone are recommended in patients with an ICD and who continue to have symptomatic ventricular arrhythmias or recurrent shocks despite optimal treatment and device reprogramming.

B	Verapamil

There are no randomised, controlled data to support the use of anti-arrhythmics for the prevention of SCD in HCM. It is recommended (class IC) for controlling ventricular rate in patients with permanent or paroxysmal AF (beta-blockers or diltiazem represent alternative options for this indication).

C	Digoxin

There are no randomised, controlled data to support the use of anti-arrhythmics for the prevention of SCD in HCM. ESC guidelines state that digoxin should be avoided in patients with LVOTO, such as in this case ('By convention, LVOTO is defined as a peak instantaneous Doppler LV outflow tract gradient of ⩾30 mm Hg, but the threshold for invasive treatment is usually considered to be ⩾50 mm Hg'), because of its positive inotropic effects. Low-dose digoxin may be considered for patients without LVOTO who are in NYHA functional class II–IV and have an EF <50% and permanent atrial fibrillation to control heart rate response, but it is not recommended in those with a preserved LV.

D	Amiodarone

If the patient were to refuse an ICD, amiodarone would be the most appropriate anti-arrhythmic choice, but it is a less suitable management option than ICD implantation. Amiodarone was associated with a lower incidence of SCD in one small observational study of patients with NSVT on Holter monitoring while in others it increased the threshold for VF, but observational data suggest that amiodarone often fails to prevent SCD.

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An 81-year-old lady is admitted to hospital with a fractured pubic ramus sustained in a fall. She undergoes successful surgery, but you are asked to see her by the orthopaedic team some 36 h after admission as she has suffered increasing breathlessness and left-sided pleuritic chest pain. She is rather confused and the nursing staff have measured her saturations at 94% on oxygen. Her pulse is 110/min and regular and her BP is 110/60 mmHg. Her chest is clear on auscultation.

Which of the following tests would be most appropriate in identifying the cause of the breathlessness?

A	12-lead ECG during the breathlessness
B	D-dimer
C	CT pulmonary angiogram
D	CXR
E	Troponin

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A	12-lead ECG during the breathlessness
B	D-dimer
C	CT pulmonary angiogram
D	CXR
E	Troponin

Explanation

C	CT pulmonary angiogram

This is a very common clinical scenario. Because this patient is likely to be rather inactive given her pubic ramus fracture, she is at markedly increased risk of pulmonary embolus. CT pulmonary angiogram is the most appropriate definitive investigation in this context. CTPA is a fast and readily available test, with increased sensitivity compared to V/Q testing, and shows superior ability to demonstrate alternative causes of symptoms such as pneumonia. However, it has a significantly higher radiation dose than V/Q scanning, making it a less attractive choice for pregnant women or women of childbearing age. It also has a higher risk of inducing nephropathy due to IV contrast than V/Q scanning, making it a less attractive choice in patients with moderate-severe renal impairment.

A	12-lead ECG during the breathlessness

The patient does not have a history of cardiac chest pain, and a 12-lead ECG is only likely to be abnormal (right ventricular strain pattern) in the presence of a large pulmonary embolus.

B	D-dimer

This would likely be raised secondary to her fracture, and thus would not be diagnostic if positive. Given the high pre-test possibility of PE, this would be a less appropriate investigation than CTPA.

D	CXR

While appropriate to perform during the course of this patient's work-up, it is a less diagnostic investigation than CTPA in this clinical context.

E	Troponin

The patient does not give a history of cardiac chest pain, and the clinical scenario is more suggestive of PE than acute MI.

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A 55-year-old homeless man is brought into the accident and emergency department having been found collapsed in an alley. On admission he is unconscious with a pulse rate of 50/min and a blood pressure of 110/70 mmHg. Pupils are equal and reactive and the tone is normal in all four limbs. A 12-lead shows an AV junctional rhythm, prominent J-waves in the precordial leads and a corrected QT interval of 0.64 s. There are no acute ischaemic changes.

Initial blood results are shown below:

WCC	4.5 x 10^9/l
Hb	13.6 g/dl
Urea	9 mmol/l (2.5–7.5)
Creatinine	120 mmol/l (60–110)
Potassium	3.2 mmol/l (3.5–4.9)
Sodium	136 mmol/l (137–144)
Blood alcohol level	100 mg/dl
Troponin-I	Normal

What is the cause of the prolonged QT interval?

A	Hypokalaemia
B	Hyperthermia
C	Alcohol
D	Hypothermia
E	Intracranial haemorrhage

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A Hypokalaemia

B Hyperthermia

C Alcohol

D Hypothermia

E Intracranial haemorrhage

Explanation

D Hypothermia

The presence of J-waves, QTc of 640ms and junctional rhythm is typical of hypothermia. With a normal neurological examination and relatively normal blood tests, this is the most likely cause of the presentation of this gentleman.

The typical ECG features of hypothermia are J-waves, prolonged QT interval and AV junctional rhythm. J-waves are positive deflections in the terminal portion of the QRS complex and are highly sensitive and specific for hypothermia. Other causes of J-waves include hypercalcemia and intracranial pathology like subarachnoid haemorrhage.

A Hypokalaemia

Hypokalaemia is one of the causes of prolonged QT. ECG changes of hypokalaemia includes prolonged PR, flattened T waves and presence of U wave (best seen in chest leads). These are not present in this patient.

B Hyperthermia

Hyperthermia normally causes the tachycardia and hypertension instead of the bradycardia seen in this patient.

C Alcohol

Even though the blood alcohol level of the patient is raised, it is not at the level which you would expect it to be at for a patient to be in a comatose state. Alcohol consumption or intoxication is more commonly associated with tachyarrhythmias like atrial fibrillation.

E Intracranial haemorrhage

Although intracranial haemorrhage can cause reduced consciousness and J waves on ECG, with the normal neurological examination, it is very unlikely.

Elevated intracranial pressure, for instance in the setting of an intracranial haemorrhage, is also a potential cause for QT prolongation and would need to be considered along with electrolyte abnormalities if treatment of the patient's hypothermia did not improve his condition.

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This is a cardiac catheter study performed on a 10-year-old boy from a travelling family who has been admitted on the paediatric take with central cyanosis.

	Pressure (mmHg)	Saturation (%)
Right atrium	7	55
Right ventricle	110/6	50
Pulmonary artery	20/5	50
Left atrium (mean)	9	99
Left ventricle	110/8	86
Aorta	110/80	75

What is the most likely diagnosis?

A	Ebstein's anomaly
B	Ventricular septal defect
C	Patent ductus arteriosus
D	Tetralogy of Fallot
E	Pulmonary regurgitation

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B	Ventricular septal defect
C	Patent ductus arteriosus
D	Tetralogy of Fallot
E	Pulmonary regurgitation

Explanation

There is a step down in oxygen concentration between the left atrium and left ventricle indicating a ventricular septal defect with a right-to-left shunt. There is also a pressure gradient between the right ventricle and the pulmonary artery indicating pulmonary stenosis. In view of these abnormalities the diagnosis is most likely Fallot's tetralogy and the step down in saturation between the left ventricle and aorta, which could theoretically be due to a patent ductus arteriosus, is most likely due to an over-riding aorta. Unfortunately this patient is too old for surgical correction, with the majority of patients undergoing corrective procedures by 1 year of age.

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A 48-year-old man is admitted for investigation following three episodes of collapse over the past month. The episodes were self-limiting, each lasting 2–3 min and associated with some twitching of the limbs. There was no tongue biting or loss of continence and he was not confused after the attacks. On examination, he has an ejection systolic murmur at the right sternal border and reversed splitting of S2. His electrocardiogram (ECG) shows sinus rhythm with left ventricular hypertrophy and strain. Chest X-ray shows an area of calcification overlying the cardiac silhouette.

Which diagnosis fits best with this clinical picture ?

A	Aortic stenosis
B	Aortic regurgitation
C	Hypertrophic cardiomyopathy
D	Coarctation of the aorta
E	Aortic sclerosis

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Which diagnosis fits best with this clinical picture ?

A	Aortic stenosis
B	Aortic regurgitation
C	Hypertrophic cardiomyopathy
D	Coarctation of the aorta
E	Aortic sclerosis

Explanation

A	Aortic stenosis

The signs of aortic stenosis include: an ejection systolic murmur, loudest in the aortic area, which radiates to the carotids and axilla; a slow rising, small volume pulse; and, in severe stenosis, there may be reversed splitting of S2. LVH and strain on ECG shows the compensatory mechanism the heart has developed to cope with the aortic stenosis. Calcification on CXR is an indication that the valve is heavily calcified.

Aortic stenosis may be asymptomatic. Symptoms include syncope, angina and dyspnoea although the classical presentation with all 3 is only found in 30-40% of individuals with aortic stenosis.

The patient in this case is describing typical cardiogenic syncope with unprovoked attacks and generally quick recovery periods.

When symptoms appear, survival without surgery is only on average 2-3 years and is therefore an indication for surgical intervention. Sudden death occurs in 1-2% of asymptomatic patients per year. Causes of aortic stenosis include congenital or rheumatic heart disease, bicuspid valve, degenerative calcification and hypertrophic obstructive cardiomyopathy. In asymptomatic patients, the valve is usually replaced when the pressure gradient across the valve exceeds 50 mmHg.

B	Aortic regurgitation

Aortic regurgitation causes a diastolic murmur and other signs like collapsing pulse which is not present in this patient. It causes LV dilatation instead of hypertrophy as it causes a volume overload state.

C	Hypertrophic cardiomyopathy

The presence of LVH with strain could be an indication of HCM. The murmur could only be present if there is LV outflow tract obstruction as in the case of hypertrophic obstructive cardiomyopathy (HOCM). With the presence of calcification on CXR, it makes it more likely to be valve calcification as the cause.

D	Coarctation of the aorta

Coarctation of aorta produces a late systolic murmur and radio-femoral delay. Rib notching present on chest x-ray is due to pressure erosion from enlarged collateral vessels. Patients may present with hypertension, headaches, nose bleeds, cold peripheries or intermittent claudication

E	Aortic sclerosis

Aortic sclerosis is the presence of calcification on aortic valve with no outflow tract obstruction. It will produce the systolic murmur and CXR findings but would not cause the splitting of S2, LVH on ECG or the symptoms the patient is experiencing.

32353

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An 18-year-old woman is brought into the accident and emergency department with an abrupt onset 30 min previously of severe chest pain. She describes the pain as 'tearing' and says it radiates into her jaw. There is no past history of cardiovascular disease. The past history is significant for primary amenorrhoea. Blood pressure is 170/110 mmHg in the right arm and 145/90 mmHg in the left, pulse rate is 120/min regularly regular, and she is afebrile. On examination the patient appears in distress and you note a diastolic murmur, muffled heart sounds and a raised JVP. You also notice that the patient is of short stature and has a broad neck. An electrocardiogram (ECG) is performed and reveals sinus tachycardia and widespread ST depression. A portable chest X-ray is performed and reveals a widened mediastinum. You suspect aortic dissection.

What is the likely underlying diagnosis?

A	Turner's syndrome
B	Pseudoxanthoma elasticum
C	Noonan syndrome
D	Marfan syndrome
E	Osteogenesis imperfecta

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A	Turner's syndrome
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Explanation

A	Turner's syndrome

This patient fits the description for Turner's syndrome – Amenorrhoea, short stature and broad neck. The presenting complain of chest pain is highly suggestive of aortic dissection and is supported by the clinical findings of blood pressure difference, diastolic murmur (AR), muffled heart sounds (effusion) and widened mediastinum.

Turner's syndrome is a chromosomal disorder resulting from the 45X karyotype. It is characterised by short stature, ovarian failure with primary or secondary amenorrhoea, webbed neck, cubitus valgus, a broad chest with widely spaced nipples, and aortic dissection in adulthood. Aortic dissection characteristically presents with a very abrupt onset of chest pain which differentiates it from the other differentials. The mediastinum is widened on the chest X-ray in many cases of aortic dissection. Around 2/3rds of dissections in Turner's arise in the ascending aorta. Epidemiological data suggests that the incidence of aortic dissection is many times higher for young women with Turner's versus age matched controls. The annual incidence is 15/100,000 years for those<20 years, and is 73-78/100,000 years for those 20-40 years of age. This is against an incidence of 6/100,000 years for those without Turner's syndrome.

B	Pseudoxanthoma elasticum

PXE is a genetic condition that can cause early onset atherosclerosis. It typically causes cutaneous and ophthalmic changes which are not described in the case. It is caused by an autosomal recessive gene mutation in ABCC6 gene on chromosome 16.

C	Noonan syndrome

Noonan syndrome is the male version of Turner's syndrome with similar characteristics. It is associated with ASDs, VSDs and pulmonary stenosis.

D	Marfan syndrome

Marfan's syndrome is a connective tissue disease. Patients typically are tall and thin with long arms and legs. It is very commonly associated with aortopathy and can present with aortic dissection.

E	Osteogenesis imperfecta

OI is a genetic disease affecting the bones. Patients will typically have short stature and blue sclera with varying involvement of their bones. This is not typically associated with cardiovascular disease.

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You review a 54-year-old woman who is tired and lethargic. She has undergone multiple dental extractions during the past few months. There is a past history of Sydenham's chorea, but nil else of note. On examination you notice subungual splinter haemorrhages and an ejection systolic murmur.

Which of the following represents the best initial investigation in this case?

A	At least three sets of blood cultures from different sites
B	A transthoracic echocardiogram
C	A transoesophageal echocardiogram
D	Erythrocyte sedimentation rate (ESR)
E	Plasma viscosity

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D	Erythrocyte sedimentation rate (ESR)
E	Plasma viscosity

Explanation

A At least three sets of blood cultures from different sites

According to Duke's criteria for diagnosis of infective endocarditis, the 2 major criteria would be a positive blood culture of typical organism and presence of vegetation on echocardiogram. In this patient, the index of suspicion is high (dental work, previous history of valvular heart disease, peripheral signs and murmur). Therefore, the initial investigation would be to obtain the blood cultures before starting antibiotic therapy.

Three sets of blood cultures from different sites are positive in 75% of cases of bacterial endocarditis, the suspected diagnosis here. The past history of Sydenham's chorea, (a condition associated with rheumatic fever) is suggestive of a pre-existing valve lesion (Duke's minor), the recent dental work providing a vector for infection. Clinical examination finding of splinters (Duke's minor) and murmur also increases the index of suspicion.

Streptococcus viridans is the usual infecting agent from dental work and is in total responsible for around 60% of cases of subacute bacterial endocarditis. Staphylococcus aureus is the most commoncause of endocarditis in prosthetic valve disease, acute infective endocarditis, and endocarditis related to IV drug abuse. Benzylpenicillin and gentamicin is the treatment of choice, this being a circumstance when the gentamicin is usually given in divided doses rather than the usual practice of once daily dosing. The antibiotics are normally given for a prolonged period (4-6 weeks) depending on response. Some patients require surgical intervention on their valves due to complications from IE (aortic root abscess, septic emboli, large vegetations causing significant valvular dysfunction).

B A transthoracic echocardiogram

Although a transthoracic echocardiogram would help in the diagnosis, it is not as readily available as blood tests. Therefore, it should not delay the blood tests and starting empirical treatment for IE.

C A transoesophageal echocardiogram

The use of transoesophageal echocardiogram should be reserved for cases where the transthoracic echocardiogram was inconclusive. Therefore, it is not a good initial investigation.

D Erythrocyte sedimentation rate (ESR)

ESR will be raised in the presence of any inflammatory process. Although it might aid in the diagnosis, it is too non-specific to help and therefore would not be the best initial investigation although one might still perform it as part of the initial workup.

E Plasma viscosity

Like ESR, PV is raised in inflammatory processes. The low specificity makes it a less useful test.

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A 54-year-old man with a past history of hypertension and smoking presents to the Emergency department. He has suffered central chest pain radiating to his back for 2h prior to presenting at the emergency department. He is hypotensive with a blood pressure of 80/60 mmHg and has a pulse of 105/min. There are bilateral basal crackles on auscultation of the chest. Electrocardiogram (ECG) shows evidence of inferior ST elevation. Transoesophageal echocardiogram reveals a double lumen in the ascending aorta.

Which diagnosis fits best with this clinical picture?

A	Aortic dissection
B	Degenerative thoracic aneurysm
C	Inferior myocardial infarction
D	Anterior myocardial infarction
E	Haemopericardium

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Explanation

A	Aortic dissection

With the history of chest pain radiating to the back and haemodynamic compromise, aortic dissection is the top of the differential diagnosis. Risk factors include male, hypertension and smoking. The presence of double lumen in the ascending aorta is indicative of aortic dissection. Inferior ST elevation indicates the involvement of the RCA due to the extension of the dissection proximally towards the coronary sinus.

Case series of dissecting aneurysms put 5-year survival in the region of 70–80% with optimal medical/surgical input in a centre of excellence. Aortic dissections which compromise the coronary arteries present a particular challenge. They are usually managed with an endovascular stenting approach but where hypotension and ischaemia exist as here, prognosis is particularly poor.

B	Degenerative thoracic aneurysm

Degenerative thoracic aneurysm is unlikely to present acutely unless the aneurysm ruptured or dissected.

C	Inferior myocardial infarction

The presence of inferior ST elevation makes this a possible differential diagnosis and it would be impossible to differentiate without the findings on echocardiogram. However, the description of chest pain radiating to the back makes it more likely to be dissection and this is confirmed with TOE.

D	Anterior myocardial infarction

ST elevation was present in the inferior leads, therefore making anterior MI unlikely.

E	Haemopericardium

Haemopericardium could be present due to leaking of blood from the ruptured aorta and could lead to haemodynamic compromise. However, in the absence of trauma, the most likely cause would be a ruptured aortic dissection.

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A 50-year-old male presents to the emergency department with central crushing chest pain, which was subsequently confirmed as a myocardial infarction. He developed atrial fibrillation 2 days post-myocardial infarction (MI) and was digitalised, although he was not fully anticoagulated at this point. Six days post-MI he banged into a bed and the wall while walking to the toilet, and appeared blind although he denied this, attempting to describe objects around his bed space. Pupillary reflexes were normal.

Which of the following best describes the lesion that has occurred?

A	Bilateral occipital lobe infarcts
B	Bilateral retinal artery thrombosis
C	Bilateral retinal vein thrombosis
D	Retinal detachment
E	Branch retinal vein occlusion

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Explanation

A	Bilateral occipital lobe infarcts

This patient has cortical blindness, lacking insight into the fact that he is unable to see. Denial of visual loss has been described previously as the Anton-Babinski syndrome, and indeed visual hallucinations are often also reported. The cause in this case is likely to be extensive occipital lobe infarcts as a result of emboli from his atrial fibrillation. Neuroimaging should be urgently performed to confirm the diagnosis. The pupillary response in this case is preserved. Unfortunately, the window for immediate treatment with thrombolysis is lost, and full heparinisation at this point increases the risk of haemorrhagic conversion.

Although he is at high risk of falls given his blindness, anticoagulation with NOACs or warfarin should still be considered to prevent further embolic events as his risk is high (CHADS2Vasc = 3 without knowing if he has CCF, hypertension or diabetes). NICE guidelines has recommended that anticoagulation should not be withheld for risk of falls.

B	Bilateral retinal artery thrombosis

AF can cause arterial thrombosis if not anticoagulated. However, as the patient was unaware that he is blind, this is in keeping with cortical blindness. In retinal artery thrombosis, the patient would be aware that he is blind. It normally affects only one eye and is described as sudden and painless. ‘Cherry red spot’ with pale retina will be seen on fundoscopy.

C	Bilateral retinal vein thrombosis

In the presence of AF, arterial thrombosis is much more likely than venous thrombosis. Vein thrombosis typically causes gradual visual blurring and loss. On fundoscopy, you will see retinal haemorrhages and oedema with dilated veins.

D	Retinal detachment

With no risk factor for retinal detachment described and bilateral involvement, it is very unlikely to be retinal detachment. Retinal detachment normally presents with acute symptoms of flashes of light and floaters. Typical risk factors include glaucoma and diabetic retinopathy.

E	Branch retinal vein occlusion

In the presence of AF, arterial thrombosis is much more likely than venous thrombosis. Given that only a branch of the vein is affected, patients typically present with reduced peripheral vision or an enlarged blind spot.

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External Links

NICE - Atrial fibrillation: management
nice.org.uk/guidance/cg180/resources/atrial-fibrillation-management-35109805981381

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A 21-year-old man presents to the emergency department having collapsed with palpitations while dancing in a night club. He has a past history of cardiac surgery to fix a hole in the heart as a child and to fix an abnormal valve. On examination in the department his BP is 135/72 mmHg, pulse is 75/min and regular. He is not in cardiac failure. ECG reveals sinus rhythm with a short PR interval; in addition there is right bundle branch block and a delta wave.

Which of the following is the most likely diagnosis?

A	Ebstein's anomaly
B	Lown–Ganong–Levine syndrome
C	Uncomplicated SVT
D	Amphetamine toxicity
E	Thyrotoxicosis

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E	Thyrotoxicosis

Explanation

A Ebstein's anomaly

The presence of delta waves and short PR interval is indicative of WPW. When correlated with his past surgical history (repair of atrial septal defect and tricuspid valve abnormalities as a child), Ebstein's anomaly is the most likely diagnosis.

Cardiac problems associated with Ebstein's generally result from abnormal formation of the tricuspid valve, atrialisation of the right ventricle and associated defects such as ASD. The condition is rare, probably accounting for around 0.5% of cases of congenital heart disease. Ebstein's may be associated with Wolff–Parkinson–White syndrome as seen here.

Digoxin and verapamil are not recommended treatments for arrhythmias associated with WPW as they may precipitate increased conduction through the accessory pathway and worsening of tachycardia. DC cardioversion is normally the treatment of choice in the acute management of tachyarrhythmia. However, for long-term management, given the patient's age, radiofrequency ablation of the accessory pathway is preferable.

B Lown–Ganong–Levine syndrome

LGL syndrome is like WPW in the sense that it is a pre-excitation syndrome. However, the ECG changes present is only short PR interval without delta waves or abnormal QRS complex.

C Uncomplicated SVT

The presence of an abnormal resting ECG i.e. short PR interval, delta waves and RBBB makes it very unlikely that it was an uncomplicated SVT.

D Amphetamine toxicity

Amphetamine can cause tachyarrhythmia but it should not influence PR interval or cause delta waves.

E Thyrotoxicosis

Thyrotoxicosis can cause tachyarrhythmia but it should not influence PR interval or cause delta waves.

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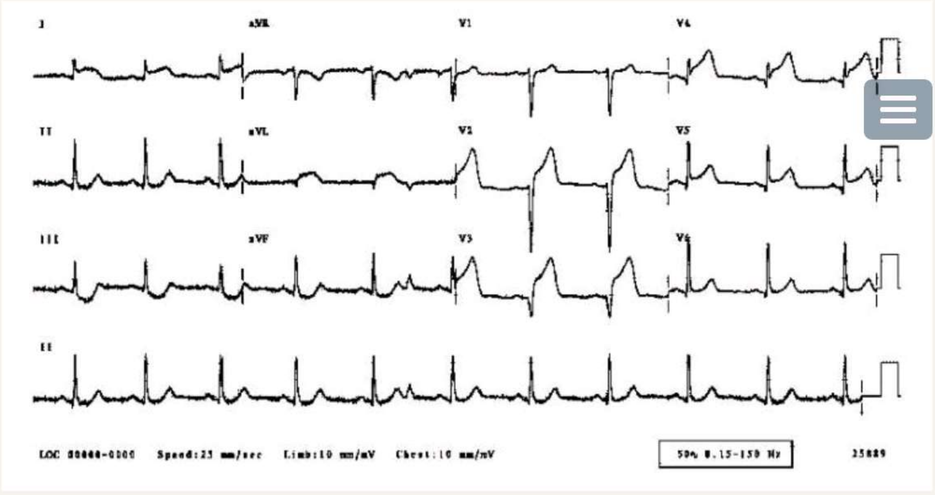
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You are called to see a 58-year old man who has had a ventricular fibrillation (VF) arrest. He reverts to sinus rhythm following the third electrical shock with a maintained BP of 110/70 mmHg. He is a smoker who has significant peripheral vascular disease and stable angina and has undergone a femoral-popliteal bypass graft on the previous day.
A post-arrest electrocardiogram (ECG) is available as shown:



Occlusion of which of the following coronary arteries is most likely to be responsible for his presentation?

A	Right coronary artery
B	Left main stem
C	Left anterior descending and circumflex arteries
D	Posterior descending artery
E	Left circumflex artery

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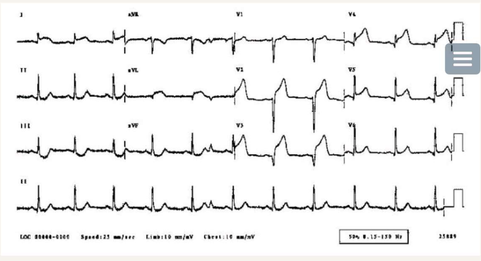
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D	Posterior descending artery
E	Left circumflex artery

Explanation

C	Left anterior descending and circumflex arteries

The ECG shows anterolateral STEMI with reciprocal inferior changes. This is likely due to the occlusion of both LAD and circumflex artery.

This man had a cardiac arrest, and was found to be in ventricular fibrillation, following an anterolateral myocardial infarction. It is not uncommon for patients undergoing vascular surgery to have an acute coronary event, as a significant number will have co-existent coronary artery disease. Due to the recent surgery, thrombolysis is contraindicated and PCI is likely to be associated with a better outcome anyway, he should therefore progress as soon as possible to the angiography suite. The fact that he has angina, suggests the disease is distal to the left mainstem, and the ECG changes fit best with the distribution of the LAD and circumflex arteries. Patients with left main stem disease often get little warning of their impending infarct.

A	Right coronary artery

Occlusion of the RCA typically causes inferior changes on the ECG. Although the ECG has inferior ST depression, it is likely to be reciprocal change of the anterolateral ST elevation in this case.

B	Left main stem

LMS occlusion typically presents dramatically with cardiogenic shock. ECG findings include ST elevation in aVR with diffuse ST depression in other leads.

D	Posterior descending artery

The posterior descending artery is a branch of the RCA (in a right dominant system). It supplies the posterior part of the heart and occlusion causes a posterior STEMI where performing an ECG with posteriorly placed leads will show ST elevation in V7-V9.

E	Left circumflex artery

Occlusion of the left circumflex artery normally causes lateral ST changes +/- posterior changes (in left dominant system).

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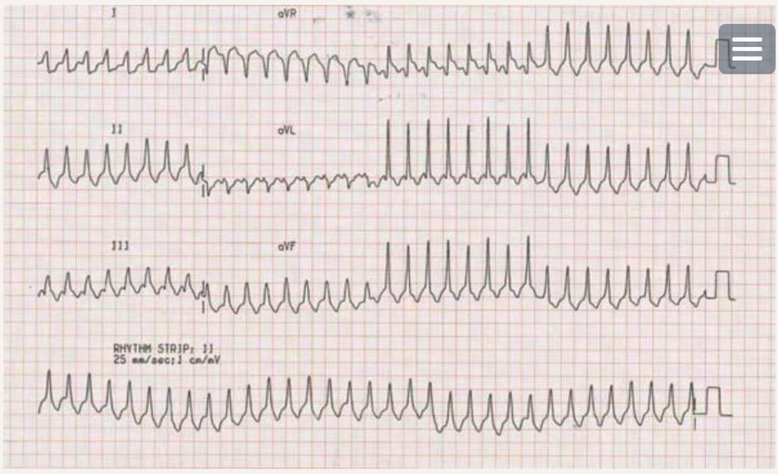
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A 65-year-old woman is brought to the Emergency Department after suffering a collapse in church around 1hr earlier. She is conscious but complains of central chest pain. There is a past history of hypertension for which she takes ramipril 10mg daily, and a previous myocardial infarction some 2 years earlier. On examination her blood pressure is 95/60 mmHg, her pulse is 150-200 beats per minute. She has bibasal crackles on auscultation of the chest.

Bloods reveal;

K^+	5.4 mmol/l
Na^+	139 mmol/l
Creatinine	150 micromol/l
Urea	8.1 mmol/l
Hb	12.1 g/dl

ECG – see below



Which of the following is the most appropriate treatment for her?

A	Loading with IV amiodarone
B	Loading with IV flecianide
C	IV adenosine bolus
D	DC synchronised cardioversion
E	Carotid sinus massage

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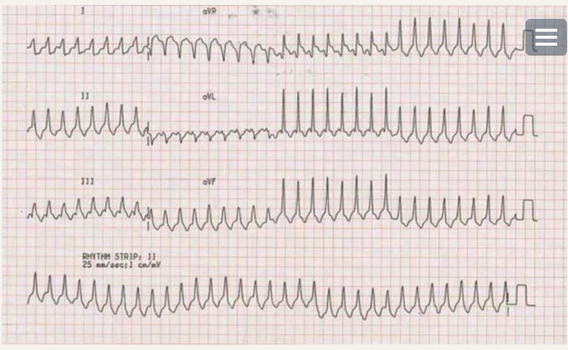
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C	IV adenosine bolus
D	DC synchronised cardioversion
E	Carotid sinus massage

Explanation

This woman has chest pain and a significant fall in her blood pressure. IV amiodarone loading, whilst a possible solution is likely to take some time and her cardiac status may worsen during this period. IV flecanide, whilst likely to achieve successful cardioversion is contra-indicated due to her previous history of ischaemic heart disease. IV adenosine and carotid sinus massage may temporarily slow her ventricular rate and reveal the underlying atrial flutter but would be unlikely to achieve cardioversion. Therefore DC synchronised cardioversion would be the treatment of choice.

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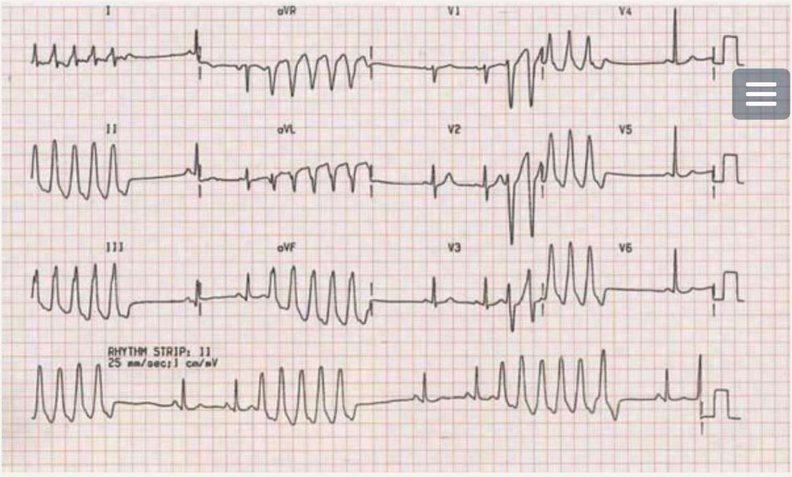
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A 54-year-old man with a history of hypertension managed with indapamide 1.5mg daily, who smokes 40 cigarettes per day presents to the Emergency Department complaining of feeling faint. He has been unwell with diarrhoea and vomiting over the past few days. Other history of note includes reactive depression after separating from his wife, for which he has been commenced on amitriptyline. On examination in the Emergency room his blood pressure is 110/70 mmHg. Blood testing in the Emergency department reveals the following results:

Na^+	140 mmol/l
K^+	3.1 mmol/l
Creatinine	170 micromol/l
Urea	13.1 mmol/l

His ECG is shown below:



Which of the following is the most appropriate first-line treatment?

A	Flecainide IV
B	Amiodarone IV
C	Sotalol IV
D	5% dextrose fluid replacement
E	Normal saline with potassium and magnesium fluid replacement

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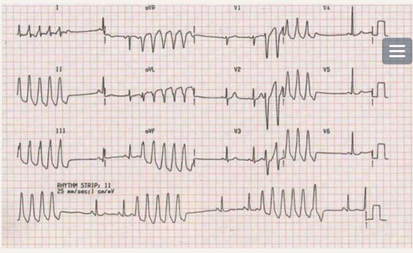
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E	Normal saline with potassium and magnesium fluid replacement

Explanation

E	Normal saline with potassium and magnesium fluid replacement

This ECG shows short self terminating runs of ventricular tachycardia. Hypokalaemia as a result of diarrhoea and vomiting plus concurrent use of indapamide will almost certainly be pro-arrhythmogenic. Additionally, significant magnesium loss occurs in association with diarrhoea. This can cause self-terminating VT which should resolve on correction of the electrolytes. Hypokalaemia is commonly associated with hypomagnesemia, therefore, both electrolytes should be replaced.

Appropriate fluid replacement to reverse electrolyte imbalances is the mainstay of initial therapy. If there is no improvement then amiodarone or lignocaine would be reasonable next options.

Sympathomimetics, tricyclic anti-depressants, digoxin, aminophylline and caffeine may all increase the propensity to develop the condition, as such after the acute event it would be sensible to review use of amitriptyline and consider either discontinuing it or changing to an alternative anti-depressant.

A	Flecainide IV

Flecainide is normally used for supraventricular tachycardia. In this case, the presence of broad complexes makes it most likely to be ventricular in origin. Therefore, flecainide has limited use in this context.

B	Amiodarone IV

Amiodarone could be used to terminate sustained ventricular arrhythmia in the acute setting. The ECG is showing self-terminating episodes of VT which could be treated by removing the precipitant which in this case is electrolyte imbalance. Therefore, the more appropriate first line treatment would be to correct the electrolyte abnormalities. Amiodarone could be considered if the patient continues to have arrhythmia despite correction and withholding precipitating drugs.

C	Sotalol IV

Sotalol could be used as an antiarrhythmic drug. Given the episodes are self-terminating, reversible causes should be treated first before considering other pharmacological therapy.

D	5% dextrose fluid replacement

With hishistory of diarrhoea and vomiting, it is very likely that the patient is volume depleted. However, it is unlikely for volume depletion to lead to self-terminating VT. Therefore, the better treatment would be to treat the underlying electrolyte imbalance whilst providing fluid resuscitation.

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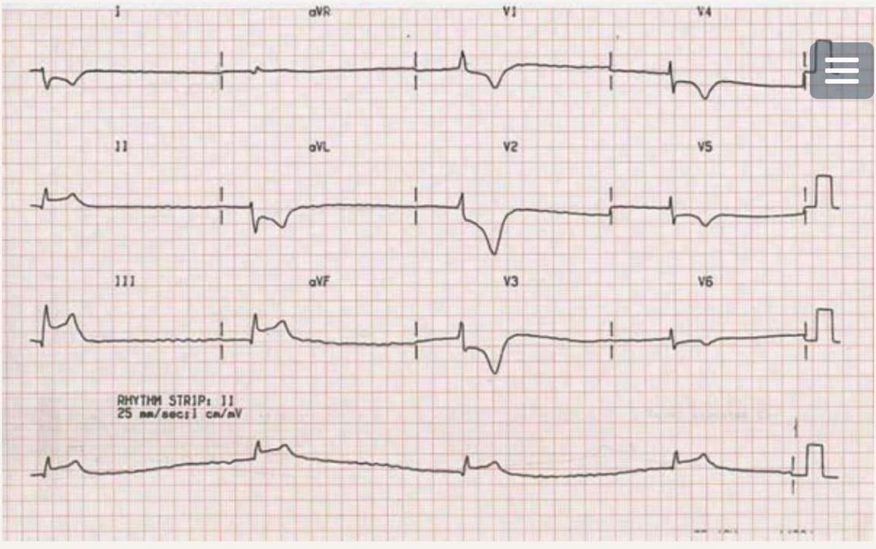
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A 59-year-old man presents to the Emergency Department with profuse sweating and central, crushing chest pain. He has a history of smoking 30 cigarettes per day and hypertension which is managed with ramipril and amlodipine. On examination he is very unwell, with BP 70/50 mmHg and a pulse of 22 beats per minute. There are no significant murmurs on auscultation of his heart; clinically, he is in mild left ventricular failure. His CXR reveals no mediastinal widening. He has already been given 1 mg of atropine by the paramedic staff.

His ECG is shown below;



Which of the following is the most likely diagnosis?

A	Complete heart block with anterior myocardial infarction
B	1st degree heart block with inferior myocardial infarction
C	2nd degree heart block with inferior myocardial infarction
D	2nd degree heart block with anterior myocardial infarction
E	Complete heart block with inferior myocardial infarction

32362

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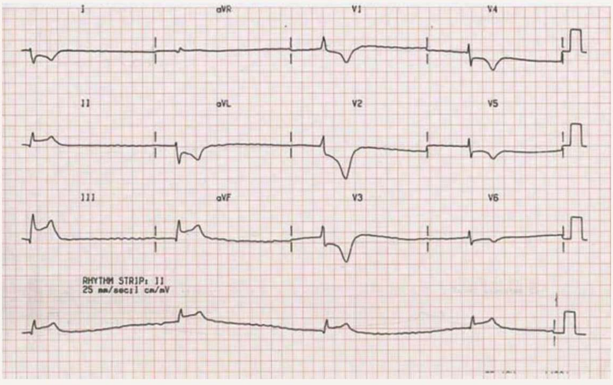
Calculator

Normal Values

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D	2nd degree heart block with anterior myocardial infarction
E	Complete heart block with inferior myocardial infarction

Explanation

The answer is Complete heart block with inferior myocardial infarction -

He has an inferior myocardial infarction with clear evidence of ST elevation in the inferior leads. Additionally there is complete heart block with significant circulatory compromise. It is unlikely that further atropine would improve the bradycardia seen, given that there has been no significant response to 1mg. The debate is between progressing straight to PCI or considering temporary transvenous pacing before commencing the procedure. Given that the systolic BP is only 70mmHg, temporary pacing is the prudent next option.

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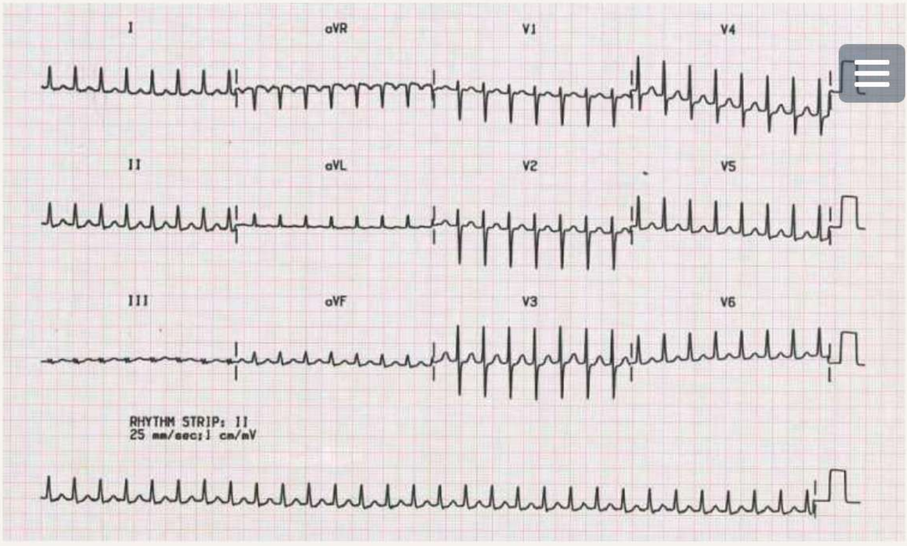
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A 27-year-old man is admitted to the Emergency Department from a nightclub. He does not consume alcohol but admits to having used amphetamines and to having snorted one line of cocaine. He tells you that his heart is thumping and he feels faint and light headed. On examination he has a blood pressure of 115/60 mmHg and a regular tachycardia of approximately 150 beats/minute. He is not in cardiac failure.

His ECG is shown below.



Which of the following is the most likely diagnosis?

A	Paroxysmal ventricular tachycardia
B	Sinus tachycardia
C	Multi-focal atrial tachycardia
D	Atrial flutter
E	AV nodal re-entrant tachycardia

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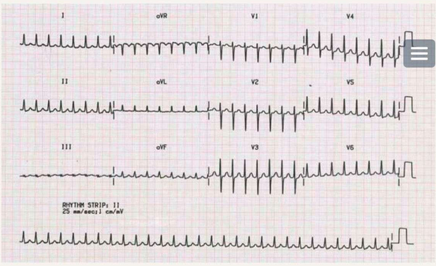
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E	AV nodal re-entrant tachycardia

Explanation

E	AV nodal re-entrant tachycardia

The presence of pseudo R' wave in V1 and the absence of P waves on the ECG makes the diagnosis of AVNRT the most likely.

This is the most commontype of re-entrant SVT, which may occur both in young healthy patients and in those with structural heart disease. The usual cause is the presence of dual AV nodal pathways (slow and fast pathways within the AV node). Patients may present at any time from the teenage years, to even as late as the seventh decade. It is likely that use of amphetamine and cocaine has precipitated this presentation.

Vagal manoeuvres could be attempted to cardiovert the patient. If it fails, the use of IV adenosine in the presence of appropriate resuscitation facility would be appropriate. Ensure that the patient is being monitored whilst adenosine is given so the underlying rhythm canbe captured. This cansometimes uncover underlying atrial flutter when the rate slows.

Calcium antagonists such as verapamil are the initial pharmacological therapy of choice if cardioversion does not work as beta blockade may lead to worsening of myocardial ischaemia in the context of cocaine overdose.

A	Paroxysmal ventricular tachycardia

The ECG shows a narrow complex tachycardia and therefore it is unlikely to be ventricular in origin.

B	Sinus tachycardia

There is no evidence of clear P-waves on the ECG

C	Multi-focal atrial tachycardia

In MAT, P waves will be present on the ECG and the morphology might vary from beat to beat due to the difference in origin of the electrical activity. The rhythm will also be irregular. It is commonly associated with severe lung disease.

D	Atrial flutter

With the rate of 150bpm, this could be atrial flutter with 2:1 block. However, there is no evidence of flutter waves on the ECG.

This is the commonest type of re-entrant SVT, which may occur both in young healthy patients and in those with structural heart disease. The usual cause is the presence of dual AV nodal pathways. Patients may present at any time from the teenage years, to even as late as the seventh decade. It is likely that use of amphetamine and cocaine has precipitated this presentation. Calcium antagonists such as verapamil are the initial pharmacological therapy of choice, as beta blockade may lead to worsening of myocardial ischaemia in the context of cocaine overdose.

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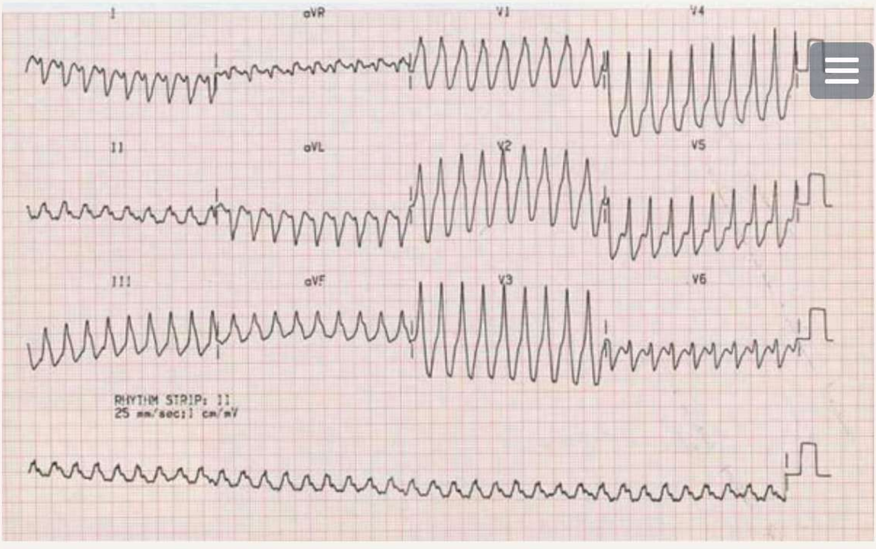
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A 74-year-old woman is brought by ambulance to hospital, after feeling faint while praying in church. Her friend from the church says that she had a heart attack a few years earlier, and has complained of palpitations on a few occasions since but has been relatively well, although she has fainted on two previous occasions recently. Medications include ramipril 10mg daily, aspirin 75mg and simvastatin 40mg. On examination she has a pulse of 170 beats per minute with a blood pressure of 110/75 mmHg. There are no signs of left ventricular failure.

Her ECG is shown below:



Which of the following is the most likely diagnosis?

A	Ventricular tachycardia
B	SVT with right bundle branch block
C	Sinus tachycardia
D	Atrial fibrillation with right bundle branch block
E	SVT with left bundle branch block

32364

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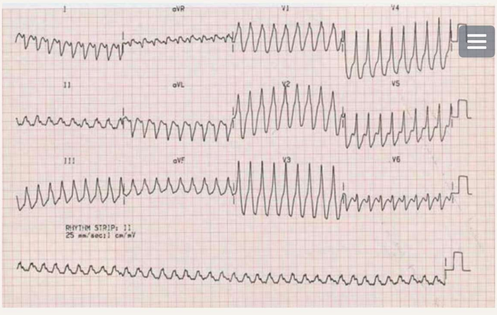
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C	Sinus tachycardia
D	Atrial fibrillation with right bundle branch block
E	SVT with left bundle branch block

Explanation

B	SVT with right bundle branch block

The ECG shows a RBBB pattern and with the regular rhythm and absence of p-waves, SVT is the likely cause of the patient's tachycardia. Flecanide should not be used in this situation with a history of previous ischaemic heart disease, and verapamil can lead to a significant reduction in cardiac output, as such these are best avoided. The use of adenosine to cardiovert the patient would be appropriate in the setting of appropriate resuscitation facilities. It will also help uncover the underlying rhythm should there be any doubt. If the patient is compromised, synchronised DC cardioversion would be the most appropriate treatment option.

A	Ventricular tachycardia

With the past history of MI, this could represent VT secondary to scar tissue. However, the absence of negative/positive concordance (deflecting in the same direction) in the chest leads and lack of haemodynamic compromise (normal BP, no evidence of HF), makes VT less likely.

C	Sinus tachycardia

There are no visible P waves therefore it is unlikely to be sinus tachycardia.

D	Atrial fibrillation with right bundle branch block

The rhythm of the ECG is regular, making it unlikely to be AF.

E	SVT with left bundle branch block

Positive deflection in V1 and negative deflection in V6 is RBBB.

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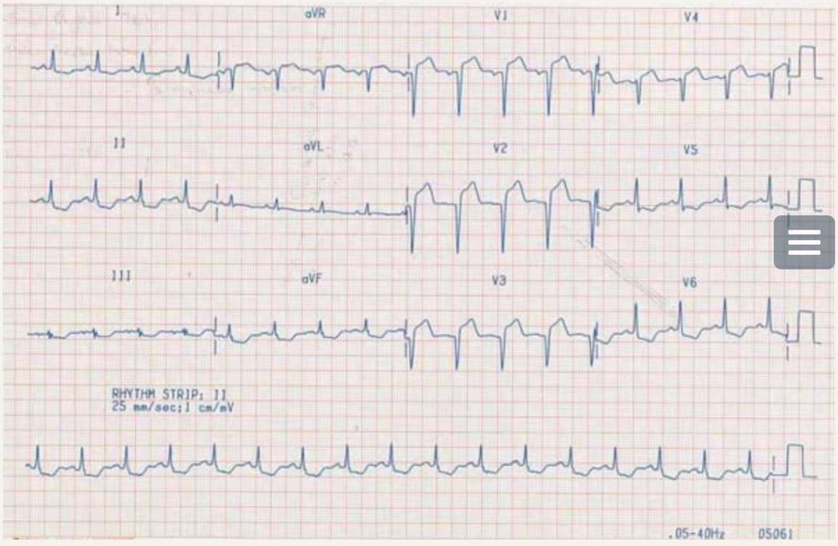
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A 62-year-old woman with a history of type 2 diabetes presents feeling faint, sweaty and unwell. She is currently managed with metformin 1g BD and ramipril 10mg daily. On examination, she looks unwell and has a blood pressure of 100/60 mmHg. Her chest x-ray shows left ventricular hypertrophy and bilateral interstitial shadowing consistent with pulmonary oedema. The admission ECG is shown below. The nurse has already given her 300mg soluble aspirin.



She undergoes acute angioplasty and makes a good recovery. Her HbA1c is measured at 63.93 mmol/mol (8.0%). She is treated with insulin during the initial period but then switched back to metformin on day 3.

What additional therapy should you commence for long-term blood glucose control?

A	Basal bolus insulin
B	Pioglitazone
C	Repaglinide
D	Long acting Insulin
E	Gliclazide

32365

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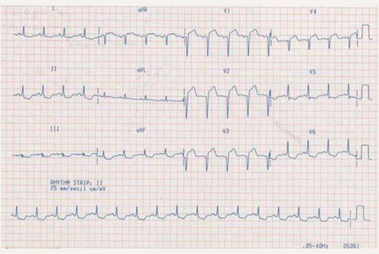
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D	Long acting Insulin
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Explanation

E	Gliclazide

Whilst the DIGAMI-1 study appeared to show a survival advantage when insulin was initiated post myocardial infarction, this was not confirmed in the DIGAMI-2 study. Some problems were however identified with the DIGAMI-2 study, in that a substantial proportion of the control group were insulin users. In spite of this, a post-hoc analysis of insulin patients in the DIGAMI-2 study demonstrated an increased risk for myocardial ischaemic events. Further data from the ACCORD and VADT studies has suggested increased risk of cardiac death when very tight glycaemic control is targeted. This was not however reflected in the ADVANCE study which utilised sulphonylureas.

This patient has inadequate control of her BM. NICE guidelines suggests aiming for an HbA1C of 7% or 54mmol/mol. Therefore, further pharmacological therapy should be initiated. The use of insulin should be considered after a trial with 2 or more oral therapy.

NICE guidelines suggest that intensification therapy should occur if HbA1C is not under control. After the use of metformin, a further agent should be added i.e. DPP4 inhibitor, sulphonylurea or glitazone. Of all the options, there is gliclazide (sulphonylurea) and pioglitazone. Glitazones are contraindicated in heart failure and this leaves gliclazide as the only viable option.

NICE guidelines (updated April 2017) have now added the new SGLT-2 inhibitors in the guidelines to consider for intensification therapy if sulphonylurea is not tolerated or patients who are at significant risk of hypoglycaemia or its consequences. SGLT-2 inhibitors block reabsorption of glucose from the renal tubules which promote excretion of glucose from the kidneys, thereby reducing blood sugar level.

GLP-1 mimetic can be used after triple therapy with metformin + 2 other oral hypoglycaemics is ineffective. GLP-1 increases insulin secretion by the pancreas.

A	Basal bolus insulin

This patient has inadequate blood glucose control and therefore requires intensification of her medications. The use of insulin should be considered after a trial with 2 or more oral therapy.

B	Pioglitazone

Pioglitazone should be avoided in patients at risk of heart failure and therefore is not a good option in this patient. Pioglitazone may cause fluid retention and should be avoided in the immediate period post MI, a specific caution is given for patients with a past history of ischaemic heart disease.

C	Repaglinide

Repaglinide belongs to the drug class of meglitinides. It works by stimulating beta pancreatic cells to produce insulin. Repaglinide is most useful in the early period after diagnosis of diabetes, particularly when post prandial hyperglycaemia is a problem. This is not one of the classes mentioned in NICE guidelines and therefore is not the correct response.

D	Long acting Insulin

This patient has inadequate BM control and therefore requires intensification of her medications. The use of insulin should be considered after a trial with 2 or more oral therapy.

32365

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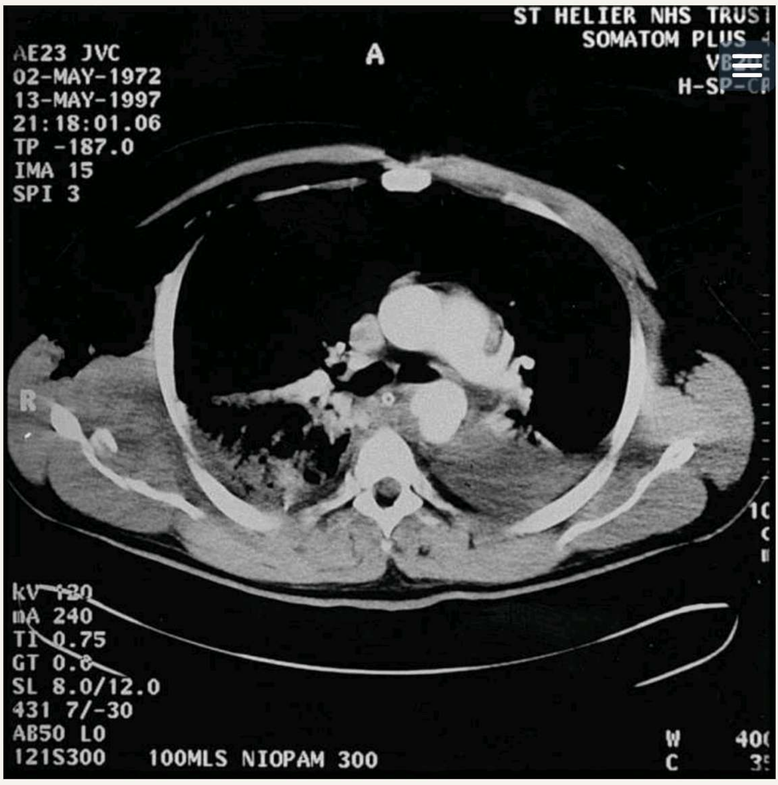
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A 25-year-old man presents with excruciating central chest pain radiating to his back. This began suddenly a few hours earlier while he was playing in a game of basketball with friends. Previous medical history of note includes lens dislocation and problems with lax, dislocatable joints, including his shoulders and patellae. On examination in the Emergency room the blood pressure in his left arm is significantly lower than the right, and he is complaining of some strange feelings and loss of power in his right arm and leg. BP is 150/90 mmHg in the right arm and 110/70 mmHg in the left arm.

A slice from his thoracic CT scan is shown below:



Which of the following is the most likely diagnosis?

A	Abdominal aortic aneurysm
B	Dissecting thoracic aortic aneurysm
C	Left pleural effusion
D	Pneumonia
E	Ruptured oesophagus

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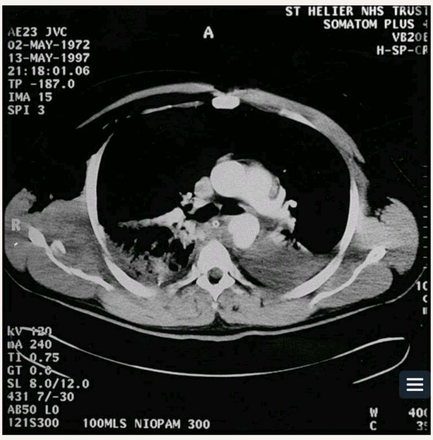
Calculator

Normal Values

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D	Pneumonia
E	Ruptured oesophagus

Explanation

B Dissecting thoracic aortic aneurysm

The history is highly indicative of Marfan's syndrome and with the sudden onset chest pain, this makes it very likely to be dissection. This is further confirmed on the CT scan slice shown. Given his age, if he didn't have a condition increasing the risk of dissecting thoracic aneurysm, like Marfan's, presentation at this age would be highly unusual. In patients with Marfan's, routine screening for aortopathy is recommended. ESC guidelines have suggested intervention for dilated aortic root of >50mm or >45 in presence of other risk factors.

Blood pressure control is vitally important in achieving a good prognosis for patients with dissecting aneurysm, and IV labetalol would be the agent of choice to control blood pressure in this case. It is an effective negative inotropic agent, which reduces cardiac contractility. Sodium nitroprusside is a useful additional adjunct, but would be avoided in this case as there are concerns about cerebral perfusion. Where beta blockade is unsuitable, then calcium channel antagonists, particularly non-dihydropridines such as diltiazem would be a logical alternative.

A Abdominal aortic aneurysm

The CT scan is showing the thoracic cavity, therefore it would not be possible to diagnose AAA on this slice.

C Left pleural effusion

On the CT slice, there is evidence of a left sided pleural effusion. However, this will not explain the presentation of this patient. Aortic dissection, which is also present in the slice would fit the diagnosis better.

D Pneumonia

The acute presentation of chest pain and the presence of blood pressure difference between the arm makes it more likely to be an aortic dissection than pneumonia.

E Ruptured oesophagus

The blood pressure difference between the arms points towards a problem with the aorta and this is further confirmed on the CT slice.

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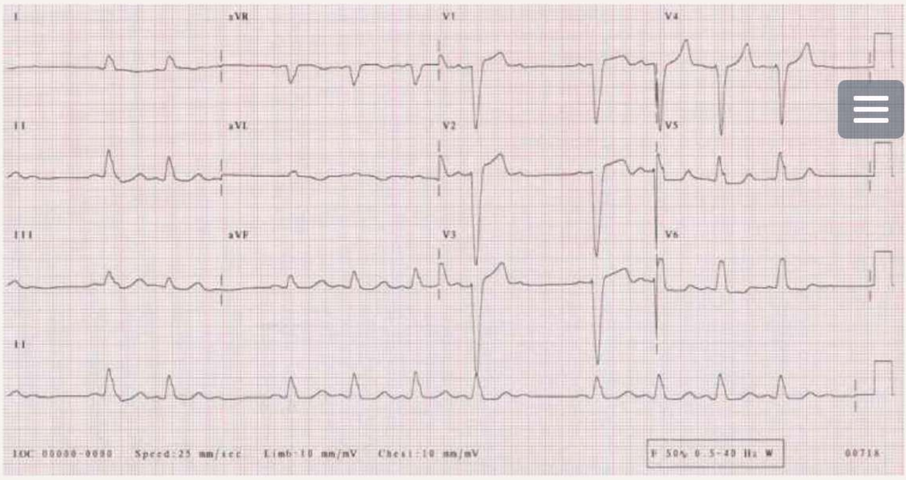
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A 79-year-old woman attends the cardiology clinic complaining of recurrent syncopal attacks. She has had two severe fainting episodes when she felt her heart was beating slowly. Although she had a myocardial infarction 10 years earlier she has been relatively well since, and is currently taking ramipril 10mg daily and bendroflumethiazide 2.5mg daily. On examination she has a blood pressure of 130/80 mmHg with a pulse of 70/min, although there are regular dropped beats.

Her ECG is shown below;



Which of the following is the most appropriate management for her?

A	Atropine IV
B	Isoprenaline IV
C	Reassurance and discharge from the clinic
D	See in 6 months with a 24hr holter monitor before clinic
E	Referral for permanent pacemaker

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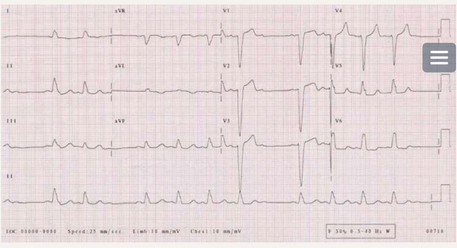
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Explanation

E	Referral for permanent pacemaker

Mobitz Type 2 is a high risk bradyarrhythmia and her syncopal attacks are almost certainly related to the ECG changes seen here. Optimal management is therefore referral for permanent pacing. If she were managed with digoxin, beta-blockers or calcium antagonists, then discontinuation of these therapies or dose reduction would be an appropriate strategy before moving to permanent pacing, although the absence of these medications in this case, would leave progression to permanent pacing as the most appropriate option.

A	Atropine IV

The ECG shows Mobitz Type 2 Av block. This is an indication for pacing. In the absence of haemodynamic compromise, the use of atropine is not required. According to the ALS peri-arrest guidelines 2015, the use of atropine is indicated for patients with bradycardia and evidence of haemodynamic compromise i.e. shock, syncope, myocardial ischemia and heart failure

B	Isoprenaline IV

The ECG shows Mobitz Type 2 Av block. This is an indication for pacing. In the absence of haemodynamic compromise, the use of isoprenaline is not required. In the ALS peri-arrest guidelines, the use of isoprenaline should only be considered after the use of atropine with inadequate response.

C	Reassurance and discharge from the clinic

Mobitz Type 2 is a high risk bradyarrhythmia and therefore needs intervention. This is a class 1c indication for pacing irrespective of symptoms according to ESC guidelines.

D	See in 6 months with a 24hr holter monitor before clinic

Mobitz Type 2 is a high risk bradyarrhythmia. Given that this is a class 1c indication for pacing irrespective of symptoms according to ESC guidelines, there is no indication for further investigations unless there are doubts about the diagnosis.

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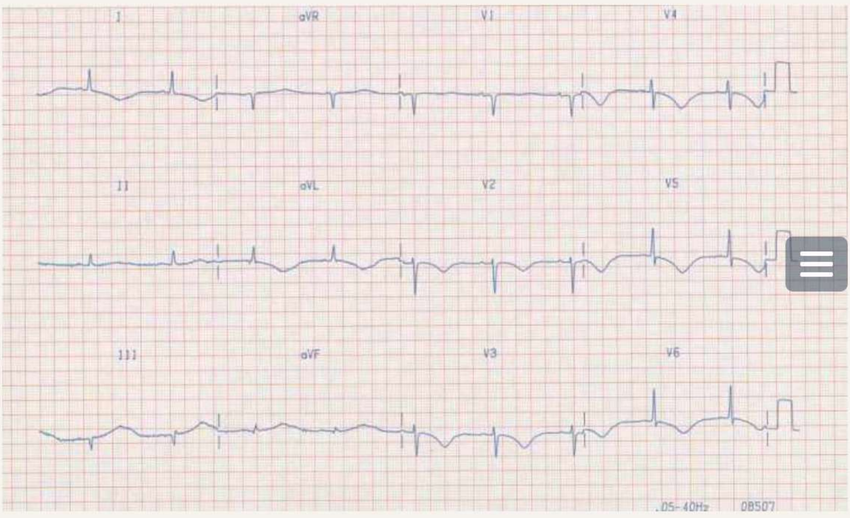
External Links

ESC Clinical Practice Guidelines
escardio.org/Guidelines/Clinical-Practice-Guidelines/Cardiac-Pacing-and-Cardiac-Res...

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A 50-year-old man with a history of hypertension presents to the Emergency department with central chest pain which came on while he was playing squash and lasted for approximately 35 minutes. He had one previous episode 3 months earlier while using a cross trainer at the gym, he did not seek medical advice. His only current medication is atenolol 50mg PO daily.

His ECG is shown below;



He is admitted and managed with subcutaneous low molecular weight heparin, aspirin and clopidogrel. BP on admission is 90/70 mmHg, pulse is 65/min and regular. Creatinine is 132 micromol/l. There is no further chest pain and his T-wave inversion appears to be partially resolved, but a 12hr troponin is raised at 3.5 μg/l.

Which of the following represents the optimal management in this case?

A	Inpatient limited exercise test
B	Plan routine angiography within 3 months
C	Plan for urgent angiography
D	Treat with streptokinase
E	Treat with TPA

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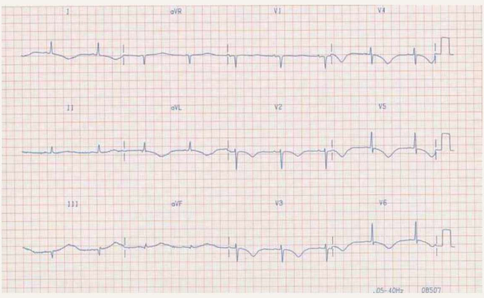
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Explanation

C Plan for urgent angiography

The T wave inversion seen on ECG, raised troponin and cardiac chest pain put this patient into the NSTEMI category. As such he is at intermediate to high risk of a further NSTEMI or STEMI with a GRACE score of 6%. Whilst he has had no further chest pain, urgent angiography with angioplasty +/- stenting where appropriate would significantly reduce the risk of further events. He should of course also be aggressively managed to statin and blood pressure control targets and started on aspirin and clopidogrel.

A Inpatient limited exercise test

In the presence of chest pain, ECG changes and raised troponin, this patient should be treated as an NSTEMI. Therefore, no further confirmatory investigation is needed.

B Plan routine angiography within 3 months

NICE guidelines have suggested performing inpatient angiography +/- PCI within 96 hours of admission on intermediate to high risk inpatients. The risk is calculated using GRACE scoring.

D Treat with streptokinase

Thrombolysis is no longer indicated except in the context of STEMI where PCI is not available within 90minutes of first medical contact.

E Treat with TPA

Thrombolysis is no longer indicated except in the context of STEMI where PCI is not available within 90minutes of first medical contact.

32368

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A 62-year-old man presents with central crushing chest pain radiating to his left arm. He has a history of hypertension, hypercholesterolaemia and Type 2 diabetes and is managed with ramipril 10mg daily, atorvastatin 40mg, metformin 1g BD, glargine insulin 40U daily.

3 months earlier he presented to the Emergency room with an anterolateral NSTEMI and received a drug eluting stent.

On examination he has a BP of 148/90mmHg, pulse 78/min regular and looks pale and sweaty.

Investigations:

Hb	14.0 g/dl
WCC	5.8 $x10^9$/l
PLT	295 $x10^9$/l
Na^+	140 mmol/l
K^+	5.0 mmol/l
Creatinine	130 µmol/l
ECG	Inferior ST elevation

You take him to the cardiac catheterisation lab for further intervention. **Which of the following is the most likely cause of his symptoms?**

A	Stent thrombosis / blockage
B	New myocardial infarction
C	Worsening angina
D	Coronary artery dissection
E	Pericarditis

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Calculator

Normal Values

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E	Pericarditis

Explanation

B New myocardial infarction

This is the correct response. The multiple cardiovascular risk factors and presence of ST elevation in the inferior leads indicate that it is very likely the RCA is now affected.

Management of choice would be angioplasty and stenting if required. Data also suggests that post-stenting in patients with Type 2 diabetes and that dual anti-platelet therapy should be continued for approximately 1 year.

A Stent thrombosis / blockage

The areas affected on the ECG aredifferent from where the previous stent was inserted. Therefore, it is unlikely that this is due to a stent thrombosis.

C Worsening angina

Angina does not present with ST elevation on ECG. It typically presents with chest pain on exertion (stable angina) and at rest (unstable angina) with no ECG changes or change in troponin level.

D Coronary artery dissection

Coronary artery dissection more commonly affects females of childbearing age without the typical cardiovascular risk factors, and is therefore less likely in this patient. A thrombotic event is more likely although dissection remains a differential.It can present like ACS with acute chest pain and can only be diagnosed on coronary angiography.

E Pericarditis

Pericarditis will show widespread ST changes with PR depression. The pain will be characteristically worse on lying flat and improved on sitting forward. The mainstay treatment for pericarditis is NSAIDs or colchicine with advice to patients to reduce physical activity for the acute period (3 months for athletes and shorter for non-atheletes).

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Responses Incorrect:	202
Responses Total:	202
Responses - % Correct:	0%

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A 32-year-old woman presents to the clinic with increasing shortness of breath. She has returned to work after the birth of her second child but is breathless climbing the stairs or even on running only a few yards to catch the bus. She has been previously well, and was a keen half marathon runner in her 20's before she started having her family. On examination her BP is 125/72 mmHg, pulse is 62/min and regular. There is a loud second heart sound, but the lungs are clear. She has bilateral pitting lower limb oedema. Abdomen is soft and non tender, her BMI is 22.

Investigations:

Hb	13.1 g/dl
WCC	9.3 $x10^9$/l
PLT	199 $x10^9$/l
Na^+	138 mmol/l
K^+	4.2 mmol/l
Creatinine	110 micromol/l
CXR	Unremarkable
Echo	Elevated estimated pulmonary artery pressure (no signs of right / left shunt / atrial septal defect (ASD))
CTPA	No evidence of pulmonary emboli
Catheterisation – Pulmonary artery pressure	38mmHg
Acute vasoreactivity testing	positive

Which of the following is the most appropriate first line therapy for her?

A	Amlodipine
B	Diltiazem
C	Bosentan
D	Iloprost
E	Sildenafil

34143

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Calculator

Normal Values

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A 32-year-old woman presents to the clinic with increasing shortness of breath. She has returned to work after the birth of her second child but is breathless climbing the stairs or even on running only a few yards to catch the bus. She has been previously well, and was a keen half marathon runner in her 20's before she started having her family. On examination her BP is 125/72 mmHg, pulse is 62/min and regular. There is a loud second heart sound, but the lungs are clear. She has bilateral pitting lower limb oedema. Abdomen is soft and non tender, her BMI is 22.

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Which of the following is the most appropriate first line therapy for her?

A Amlodipine

B Diltiazem

C Bosentan

D Iloprost

E Sildenafil

Explanation

A Amlodipine

This patient has primary pulmonary hypertension as confirmed on catheterisation showing pulmonary artery pressure of 38mmHg (>25mmHg). Two factors drive the therapy choice here, the first is the positive reactivity testing, the other is the relative bradycardia on clinical examination. Positive vasoreactivity testing drives calcium channel antagonists as initial therapy of choice. Relative bradycardia drives the choice of a non-cardioselective calcium channel antagonist, rather than diltiazem which could precipitate symptomatic bradycardia.

B Diltiazem

The vasoreactivity being positive makes CCB the better choice of treatment for PPH. However, with her HR of 62BPM, diltiazem is a less favourable option compared to non-rate limiting CCB.

C Bosentan

Bosentan is an oral active dual endothelin receptor type A and B antagonist and it is used for patients who are not vasoreactive. It can also be used as a combination therapy in patients who have not responded to high dose CCB.

D Iloprost

Iloprost is a prostacyclin analogue and is used for patients who are not vasoreactive. It can also be used as a combination therapy in patients who have not responded to high dose CCB.

E Sildenafil

Sildenafil is an oral selective inhibitor of phosphodiesterase type 5 and is used for patients who are not vasoreactive. It can also be used as a combination therapy in patients who have not responded to high dose CCB.

34143

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Responses Correct:	0
Responses Incorrect:	203
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External Links

ESC Clinical Practice Guidelines
escardio.org/Guidelines-&-Education/Clinical-Practice-Guidelines/Pulmonary-Hyperte...

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A 76-year-old man who is known to have ischaemic heart disease, suffers a collapse and cardiac arrest whilst out walking his dog with his daughter. On arrival in the Emergency Department, he has already been intubated and CPR has commenced. He is pulseless with no respiratory effort. ECG on the defibrillator reveals small complexes with a normal morphology (PEA).

Which of the following is recommended as part of Advanced Life Support (ALS) 2015 guidelines?

A	Adrenalin 3mg repeated every 2 minutes
B	Amiodarone 300mg IV bolus
C	Adrenalin 1mg repeated every 3-5 minutes
D	Atropine 3mg repeated every 2 minutes
E	rTPA IV bolus

34144

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Calculator

Normal Values

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C	Adrenalin 1mg repeated every 3-5 minutes
D	Atropine 3mg repeated every 2 minutes
E	rTPA IV bolus

Explanation

C	Adrenalin 1mg repeated every 3-5 minutes

In the presence of a non-shockable rhythm as in this case, the use of adrenaline (1mg) every alternate cycle of CPR is recommended. It should be given once IV or IO access is attained.

The problem of designing ALS guidelines is that randomised controlled trial evidence is obviously difficult to obtain. Despite this, based on animal experience and the known alpha adrenergic agonist activity of adrenaline, use is still recommended in pulseless electrical activity (PEA) and asystole, every 3-5 minutes (alternate cycles of cardiopulmonary resuscitation (CPR)), and in ventricular fibrillation (VF)/ventricular tachycardia (VT) which is non-responsive to shocking, also every 3-5 minutes.

A	Adrenalin 3mg repeated every 2 minutes

In the presence of a non-shockable rhythm as in this case, the use of adrenaline (1mg not 3mg) every alternate cycle of CPR is recommended.

B	Amiodarone 300mg IV bolus

The use of amiodarone is only recommended in a shockable rhythm after 3 unsuccessful shocks.

D	Atropine 3mg repeated every 2 minutes

The use of atropine is not indicated in ALS guidelines for PEA arrest. Atropine was recommended until 2005, but several studies since then have not supported it's use, it is therefore no longer recommended.

E	rTPA IV bolus

The use of thrombolysis is not indicated in ALS guidelines for PEA arrest. In the context of a MI causing the initial cardiac arrest, PCI should be considered if feasible.

34144

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Responses Correct:	0
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Responses Total:	204
Responses - % Correct:	0%

External Links

Resuscitation guidelines
resus.org.uk/resuscitation-guidelines/

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A 26-year-old man comes to the cardiology clinic for review. He is concerned as his father died suddenly some 6 weeks earlier at the age of 52, and was found on post mortem to have evidence of hypertrophic obstructive cardiomyopathy, (HOCM). On examination, his BP is 145/85 mmHg, pulse is 78/min and regular. The apex beat is displaced laterally and there is an ejection systolic murmur.

Which of the following ECG findings would most support a diagnosis of HOCM?

A	Anterior Q waves
B	Inferior T wave inversion
C	P mitrale
D	P pulmonale
E	Right bundle branch block

34145

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Calculator

Normal Values

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Which of the following ECG findings would most support a diagnosis of HOCM?

A	Anterior Q waves
B	Inferior T wave inversion
C	P mitrale
D	P pulmonale
E	Right bundle branch block

Explanation

E	Right bundle branch block

The presence of RBBB is correlated with anterior, anteroseptal and mid-septal myocardial fibrosis in HOCM. ECG changes seen in HOCM include right or left axis deviation, bundle branch block, PR prolongation, and non specific T wave abnormalities, although these are more commonly seen in anterior leads.

A	Anterior Q waves

Anterior Q waves is indicative of previous full thickness infarct of the anterior wall. In HOCM, the presence of Q waves is more typically in inferolateral leads.

B	Inferior T wave inversion

Inferior T wave inversion is more in keeping with ischemia along the inferior wall of the LV.

C	P mitrale

P mitrale is associated with left atrial enlargement.

D	P pulmonale

P pulmonale is associated with pulmonary disease as the name suggests.

34145

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Responses Correct:	0
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Responses Total:	205
Responses - % Correct:	0%

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A 74-year-old man is admitted after a collapse. He has a history of ischaemic heart disease and chronic obstructive pulmonary disease. According to his daughter who comes to the Emergency department soon after he is brought in, he has recently been started on some new medication by his GP for a respiratory tract infection. On examination his BP is 80/60 mmHg, he looks grey and sweaty. There are bilateral crackles and wheeze on auscultation of the chest. The monitor shows runs of torsades de pointes VT.

Which of the following medications is most likely to have precipitated this event?

A	Co-amoxiclav
B	Erythromycin
C	Ramipril
D	Spironolactone
E	Theophylline

34146

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Normal Values

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B	Erythromycin
C	Ramipril
D	Spironolactone
E	Theophylline

Explanation

B	Erythromycin

Torsades de pointes VT is associated with hypokalaemia, hypomagnaesaemia and drugs which prolong the QT interval, which of course include the macrolides, such as erythromycin and clarithromycin. Other drugs known to lead to prolong QT include agents such as domperidone and ketoconazole.

Treatment is to correct electrolyte abnormalities and withhold offending drugs. It is usually self-limiting and IV magnesium is commonly used to stabilise the rhythm. However, in patients who are haemodynamically compromise, DC cardioversion may be the treatment of choice.

A	Co-amoxiclav

Co-amoxiclav is not a drug that commonly causes long QT which could've precipitated torsade.

C	Ramipril

Ramipril is not a drug that causes prolonged QT and can sometimes cause hyperkalaemia instead of hypokalaemia which can also precipitate Torsades.

D	Spironolactone

Spironolactone does not cause QT prolongation and causes hyperkalaemia.

E	Theophylline

Whilst theophylline is known to precipitate hypokalaemia, it is likely to have been used chronically in this case rather than to have been started acutely.

34146

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Difficulty: Very Easy

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Responses Correct:	0
Responses Incorrect:	206
Responses Total:	206
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You are running in the local park when a 58-year-old man training next to you suddenly clutches his chest and sits down. He complains of central crushing chest pain. Whilst you are talking to him he suffers a collapse, is pulseless, unconscious and making no respiratory effort. The park is empty apart from you two.

Which of the following is the most appropriate next step?

A	Give a pre-cordial thump
B	Look for a defibrillator
C	Shout for help / call 999
D	Start chest compressions
E	Start mouth to mouth

34147

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Calculator

Normal Values

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E	Start mouth to mouth

Explanation

Basic life support guidelines are clear, a key first step is to enlist help / ensure that someone dials 999 or goes to find an automated external defibrillator (AED). Many gyms are equipped with this type of equipment and time to defibrillation is crucial with respect to survival. Next it is important to start chest compressions, and the guideline now recommends 30 compressions to every two breaths. Pre-cordial thump is now no longer recommended as part of the guidelines.

https://www.resus.org.uk/resuscitation-guidelines/

34147

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Responses Correct:	0
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Responses Total:	207
Responses - % Correct:	0%

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A 70-year-old woman is admitted to the Emergency department with central crushing chest pain, nausea, sweating and syncope. She has suffered two previous inferior myocardial infarctions in the past 3 years, and has Type 2 diabetes for which she takes metformin. Recent echocardiography has revealed an ejection fraction of 30%. On examination her BP is 124/80 mmHg, pulse is 85/min, and she has continued dull chest pain. There are bibasal crackles on auscultation of the chest.

Investigations:

Hb	12.9 g/dl
WCC	10.2 $x10^9$/l
PLT	243 $x10^9$/l
Na^+	138 mmol/l
K^+	4.3 mmol/l
Creatinine	131 micromol/l
6hr troponin	3.9
ECG	ST depression in V1-V4

She is given aspirin 300mg and clopidogrel 300mg and her pain gradually settles.
Which of the following is the most appropriate next step?

A	Unfractionated heparin
B	Enoxaparin
C	Fraxiparin
D	Fondaparinux
E	Bivalirudin

34960

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Calculator

Normal Values

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A 70-year-old woman is admitted to the Emergency department with central crushing chest pain, nausea, sweating and syncope. She has suffered two previous inferior myocardial infarctions in the past 3 years, and has Type 2 diabetes for which she takes metformin. Recent echocardiography has revealed an ejection fraction of 30%. On examination her BP is 124/80 mmHg, pulse is 85/min, and she has continued dull chest pain. There are bibasal crackles on auscultation of the chest.

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C	Fraxiparin
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Explanation

This patient has continued chest pain, and given her cardiac history she is at significant infarct risk, certainly above 3% over a 6 month period. As such she is likely to progress to early angiography, and in this case, unfractionated heparin is preferred according to NICE guidelines to fondaparinux. A glycoprotein inhibitor should also be added. Bivalirudin is an alternative to heparin plus glycoprotein inhibitor where angiography is considered within 24hrs.

http://www.nice.org.uk/guidance/published?type=cg

34960

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Session Progress

Responses Correct:	0
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Responses Total:	208
Responses - % Correct:	0%

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A 74-year-old man with a known history of ischaemic heart disease is brought to the Emergency department by ambulance after collapsing in the local supermarket. On arrival in the department his BP is 90/50 mmHg, he looks grey and sweaty. He has very rapid regular palpitations, and bilateral crackles consistent with heart failure on auscultation of his chest. His ECG shows ventricular tachycardia with a ventricular rate of around 230 BPM.

Investigations (arterial blood gas);

pH	7.40
pO_2	8.9 kPa
pCO_2	4.4 kPa
Na^+	138 mmol/l
K^+	4.5 mmol/l
Urea	6.0 mmol/l
Bicarbonate	21 mmol/l

Which of the following is the most appropriate next step?

A	IV magnesium sulphate
B	IV calcium gluconate
C	IV lignocaine
D	IV amiodarone
E	Synchronised DC cardioversion

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Calculator

Normal Values

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Which of the following is the most appropriate next step?

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B	IV calcium gluconate
C	IV lignocaine
D	IV amiodarone
E	Synchronised DC cardioversion

Explanation

This man is hypotensive with heart failure and ventricular tachycardia. He is therefore at imminent risk of either pulseless VT or a VF arrest. In this situation the most logical step is immediate DC cardioversion, rather than waiting for anti-arrhythmics to take effect, (although both lignocaine and amiodarone are reasonable options for the treatment of VT). IV magnesium is used in the treatment of torsades de pointes VT, which usually occurs in conjunction with QT prolongation.

34965

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Responses - % Correct:	0%

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A 23-year-old trainee solicitor comes to the Emergency department with a third episode of paroxysmal SVT in the last 3 months. He has recently been given a diagnosis of Wolff-Parkinson-White syndrome. He consumes no alcohol and drinks up to 4 cups of coffee per day. On this occasion he collapsed while giving a presentation at his office. He is already taking a mid dose of sotalol as prophylaxis against further events. His BP is 95/60 mmHg, pulse is 160/min and regular, he is electrically cardioverted.

Which of the following is the most appropriate next step?

A	Add amiodarone
B	List for implantable cardioverter defibrillator
C	Refer for electrophysiology studies
D	Switch to verapamil
E	Teach him to use the valsalva manoeuvre

34966

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Calculator

Normal Values

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Explanation

This young man is likely to have further episodes of supraventricular tachycardia (SVT), given that he is already treated with sotalol. These are significantly impacting on his ability to do his job, hence a definitive intervention is required. In this regard, electrophysiology studies, followed by consideration of radiofrequency ablation is the logical next step. Switching anti-arrhythmics or teaching him manoeuvres to abort the rhythm disturbance are a poor substitute.

34966

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Responses Correct:	0
Responses Incorrect:	210
Responses Total:	210
Responses - % Correct:	0%

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A 45-year-old rugby player is admitted to the Emergency department suffering from palpitations. He is on tour with his team, and they were celebrating victory in a local bar when he consumed 8-10 pints of strong lager. He awoke at 3am with fast, irregular palpitations, and immediately called for an ambulance. He has no past medical history of note, takes no medications, and runs 20-25km per week. Unfortunately he isn't fasted. On examination his BP is 110/70 mmHg, pulse is 125/min, irregular. There are no murmurs and no signs of cardiac failure.

Investigations;

Hb	13.9 g/dl
WCC	8.0 $x10^9$/l
PLT	203 $x10^9$/l
Na^+	138 mmol/l
K^+	3.9 mmol/l
Creatinine	103 micromol/l
ECG	Fast atrial fibrillation, ventricular rate 122/min
CXR	Normal heart size, no signs of cardiac failure
Echocardiogram	Structurally normal heart

He is given low molecular weight heparin

Which of the following is the most appropriate next step?

A	IV flecainide
B	Oral amiodarone
C	IV amiodarone
D	Oral diltiazem
E	Oral bisoprolol

34968

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Calculator

Normal Values

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A 45-year-old rugby player is admitted to the Emergency department suffering from palpitations. He is on tour with his team, and they were celebrating victory in a local bar when he consumed 8-10 pints of strong lager. He awoke at 3am with fast, irregular palpitations, and immediately called for an ambulance. He has no past medical history of note, takes no medications, and runs 20-25km per week. Unfortunately he isn't fasted. On examination his BP is 110/70 mmHg, pulse is 125/min, irregular. There are no murmurs and no signs of cardiac failure.

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Which of the following is the most appropriate next step?

A	IV flecainide
B	Oral amiodarone
C	IV amiodarone
D	Oral diltiazem
E	Oral bisoprolol

Explanation

This man has no evidence of structural heart disease, and his episode of paroxysmal AF is likely to be related to alcohol excess. As such chemical cardioversion with IV flecainide is appropriate. In the presence of structural heart disease, amiodarone would be the alternative choice. His BP is stable, so there isn't an imminent need for electrical cardioversion. Oral bisoprolol would be a reasonable choice for prophylaxis if further episodes of PAF occur.

34968

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A 74-year-old man with a history of ischaemic heart disease presents to the Emergency department at 5am with acute shortness of breath. He is already treated with ramipril 10mg, bisoprolol 5mg, aspirin 75mg, atorvastatin 10mg and furosemide 40mg/day. His BP is 165/100 mmHg, O2 sats were 90% on air when the paramedics attended, his pulse is 100 and regular. He has crackles consistent with LVF throughout both lung fields. According to the computer a blood sample from 2 weeks earlier revealed a creatinine of 150 micromol/l.

Investigations (venous blood gas);

Hb	13.2 g/dl
Na^+	137 mmol/l
K^+	5.0 mmol/l
Urea	9.2 mmol/l
pH	7.35
Bicarbonate	22 mmol/l

ECG – Sinus tachycardia, lateral ST depression
Oxygen therapy has been commenced by ambulance staff

Which of the following is the most appropriate next intervention?

A	IV Dobutamine
B	IV Furosemide
C	CPAP
D	IV Nitrate
E	IV Diamorphine

36024

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Explanation

This patient is hypertensive with signs of pulmonary oedema, hence there is room for manoevre with respect to fluid off-loading with loop diuresis. In practice this is likely to be followed by IV nitrate therapy titrated according to blood pressure. Although both the urea and creatinine are elevated, you would tolerate a small rise in both because of the likely improvement in LV symptoms. Opinions on use of diamorphine is mixed, with outcomes data suggesting opiates may be associated with increased need for intervention with respect to ventilation. A recent study on non-invasive ventilatory support showed no improvement in mortality or need for invasive ventilation versus standard medical therapy alone; it too has therefore fallen out of favour.

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You are crash called to a 67-year-old man who is recovering on the surgical ward after a cholecystectomy. He has a past history of ischaemic heart disease and Type 2 diabetes mellitus. On examination his BP is 70/50 mmHg, his pulse is 240/min and regular, and looks like ventricular tachycardia on the defibrillator monitor.

Which of the following is the most important intervention?

A	IV Amiodarone
B	IV Lignocaine
C	DC cardioversion
D	IV Adrenalin
E	IV Magnesium

36025

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Calculator

Normal Values

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Which of the following is the most important intervention?

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B	IV Lignocaine
C	DC cardioversion
D	IV Adrenalin
E	IV Magnesium

Explanation

This man has unstable VT and is at imminent risk of developing either pulseless VT or VF. Whilst amiodarone or lignocaine may be options in patients with stable VT, there is no time to wait, therefore DC cardioversion is the most appropriate intervention. The anaesthetist, who attends as part of the resuscitation scheme, gives you the option of sedation if required. Given that the patient has undergone abdominal surgery he may be potassium and magnesium depleted, but these can be replaced soon after the cardioversion if required.

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A 38-year-old man is admitted after suffering palpitations and an episode of pre-syncope. He had completed a half marathon for charity on the same afternoon and then was drinking beer with friends to celebrate afterwards. He estimates that he has consumed some 6-8 pints of lager over the past 5hrs. On examination his BP is 110/60 mmHg, pulse is 150/min. His chest is clear with no signs of LVF.

Investigations;

Hb	13.2 g/dl
WCC	8.1 $x10^9$/l
PLT	200 $x10^9$/l
Na^+	138 mmol/l
K^+	3.9 mmol/l
Creatinine	110 micromol/l
ECG	Atrial flutter with 2:1 block
CXR	No evidence of cardiomegaly or heart failure

Which of the following is the most appropriate intervention?

A	IV Flecainide
B	IV Digoxin
C	IV Verapamil
D	IV Amiodarone
E	IV Esmolol

36470

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A 38-year-old man is admitted after suffering palpitations and an episode of pre-syncope. He had completed a half marathon for charity on the same afternoon and then was drinking beer with friends to celebrate afterwards. He estimates that he has consumed some 6-8 pints of lager over the past 5hrs. On examination his BP is 110/60 mmHg, pulse is 150/min. His chest is clear with no signs of LVF.

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Which of the following is the most appropriate intervention?

A	IV Flecainide
B	IV Digoxin
C	IV Verapamil
D	IV Amiodarone
E	IV Esmolol

Explanation

This patient is fit and healthy with no history of previous ischaemic heart disease or evidence of structural heart disease. As such Flecainide is indicated and is associated with the greatest chance of attaining sinus rhythm. In the presence of structural heart disease Amiodarone would be the logical alternative. IV Digoxin and Verapamil achieve rate control rather than attaining sinus rhythm, and Esmolol is a short acting beta blocker used in the treatment of paroxysmal SVT.

36470

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A 67-year-old Afro-Caribbean man with a history of hypertension comes to the clinic for review. He failed to tolerate a calcium channel blocker due to ankle swelling so was initially treated with Indapamide. 3 months later his BP is still elevated at 155/95 mmHg. BMI is 33. His creatinine is 105 micromol/l.

Which of the following is the most appropriate next intervention?

A	Amlodipine
B	Valsartan
C	Bendroflumethiazide
D	Atenolol
E	Chlorthalidone

36473

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Calculator

Normal Values

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Explanation

In patients of Afro-Caribbean origin, angiotensin receptor blockers are preferred to ACE inhibitors at step 2, for this reason Valsartan is the preferred option. Given he has previously suffered ankle swelling on a calcium antagonist, Amlodipine is best avoided. Atenolol is not recommended as a first or second line anti-hypertensive agent, particularly in the obese population because of it's association with impaired glucose tolerance. Chlorthalidone is another thiazide like diuretic with a similar MoA to Indapamide.

http://www.nice.org.uk/guidance/CG127

36473

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A 71-year-old man is admitted to the Emergency Department after a collapse. This is his third episode of syncope in the past 3 months. An ECG from the previous episode reveals Mobitz type 2 heart block, a past history of inferior myocardial infarction and hypertension managed with Ramipril, Bisoprolol 2.5mg and Indapamide is noted. On examination his BP is 125/60 mmHg, pulse is 30/min and regular. He is not in cardiac failure. His rate does not improve with 1mg of Atropine. ECG reveals complete heart block.

Which of the following is the most appropriate next step?

A	Admit for permanent pacing
B	Discharge and list for a permanent pacemaker as an outpatient
C	Stop Bisoprolol and review in 4 weeks
D	Fix a temporary pacemaker
E	Give a further 2mg Atropine IV

36483

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Calculator

Normal Values

Haematology

Haemoglobin

Males:13.5 - 17.5 g/dl

Females:11.5 - 15.5 g/dl

MCV:76 - 98 fl

Haematocrit:0.35 - 0.55

WCC:4 - 11 x 10^9/l

Neutrophils:2.5 - 7.58 x 10^9/l

Lymphocytes:1.5 - 3.5 x 10^9/l

Platelets:150 - 400 x 10^9/l

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C	Stop Bisoprolol and review in 4 weeks
D	Fix a temporary pacemaker
E	Give a further 2mg Atropine IV

Explanation

This patient has had 3 collapses and is now in complete heart block. At present the BP is stable and he is not in heart failure, as such there is no urgent need for temporary pacing. Giving Atropine or stopping the Bisoprolol is unlikely to impact significantly on the heart rate. Given the 3 collapses have happened over the course of 12 weeks, discharging him represents a significant mortality risk; as such he should be admittted for permanent pacing as an inpatient.

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A 32-year-old woman is being prepared for surgery for medullary carcinoma of the thyroid. She also has a history of poorly controlled hypertension, and a preoperative abdominal CT raises the possibility of a left phaeochromocytoma. Her BP is 165/90 mmHg, with pulse 85/min and regular.

Which of the following is the optimal initial intervention with respect to controlling her BP preop?

A	Atenolol
B	Amlodipine
C	Indapamide
D	Phenoxybenzamine
E	Ramipril

36484

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Calculator

Normal Values

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Which of the following is the optimal initial intervention with respect to controlling her BP preop?

A	Atenolol
B	Amlodipine
C	Indapamide
D	Phenoxybenzamine
E	Ramipril

Explanation

D Phenoxybenzamine

This patient has a phaeochromocytoma, a neuroendocrine tumour of the adrenal medulla that secretes catecholamines (primarily nor-adrenaline). Blockade of adrenoceptors is thus required to control blood pressure. α-Blockade should be initiated first; if beta-blockade is undertaken initially, this can lead to unopposed alpha stimulation and precipitate a hypertensive crisis. The presence of medullary-type carcinoma of the thyroid combined with phaeochromocytoma should raise the possibility of multiple endocrine neoplasia type 2.

A Atenolol

Atenolol is a selective β_1 antagonist. If β-blockade is undertaken as initial therapy in a phaeochromocytoma, unopposed alpha-receptor stimulation by circulating nor-adrenaline can result in a hypertensive crisis. β-Blockade, usually with a selective β_1 antagonist, can be considered during surgical resection of the tumour.

B Amlodipine

Amlodipine is a dihydropyridine-type calcium channel blocker. Phaeochromocytomas result in elevated circulating levels of catecholamines and it is through this mechanism that hypertension results. As such, α-blockade should be the primary mechanism by which hypertension is controlled in this patient. Calcium channel blockade can be undertaken if further therapy is required to control blood pressure.

C Indapamide

Indapamide is a thiazide-like diuretic. α-Blockade is required to counteract the high circulating levels of catecholamines secondary to the phaeochromocytoma. Indapamide has no central role in the treatment of hypertension in this situation.

E Ramipril

Ramipril is an ACE-inhibitor. Although it has a central role in the management of hypertension within the general hypertensive population, it is not used as a primary antihypertensive agent in those with phaeochromocytoma.

36484

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A 29-year-old woman who is 24 weeks pregnant presents to the Emergency Department with sudden onset left sided pleuritic chest pain. She has been unwell at home over the past few days with a heavy cold, but apart from that her pregnancy has gone very well. On examination she looks short of breath, her BP is 105/70 mmHg, pulse is 85/min and regular. Heart sounds are normal and her chest is clear. O_2 saturations are 92% on air. Both legs appear normal.

Investigations;

Hb	11.4 g/dl
WCC	7.8 $x10^9$/l
PLT	201 $x10^9$/l
Na^+	137 mmol/l
K^+	4.4 mmol/l
Creatinine	100 micromol/l
CXR	Clear lung fields

Which of the following is the optimal way to confirm PE in this patient?

A	D-dimer
B	CTPA
C	Half dose VQ
D	Bilateral lower limb ultrasound
E	Echocardiogram

36571

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Calculator

Normal Values

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A	D-dimer
B	CTPA
C	Half dose VQ
D	Bilateral lower limb ultrasound
E	Echocardiogram

Explanation

The answer is Half dose VQ -

In the pregnancy situation, d-dimers are unreliable, as such they are not of value in this situation. Whilst bilateral lower limb ultrasound is useful where there is leg swelling, it doesn't exclude asymptomatic proximal venous thrombosis. As such this leaves CTPA or half dose VQ as the potential correct options. Half dose VQ involves a lower dose of radiation and therefore preferred. Echocardiography may show acute right sided dilatation, but this is by no means diagnostic.

36571

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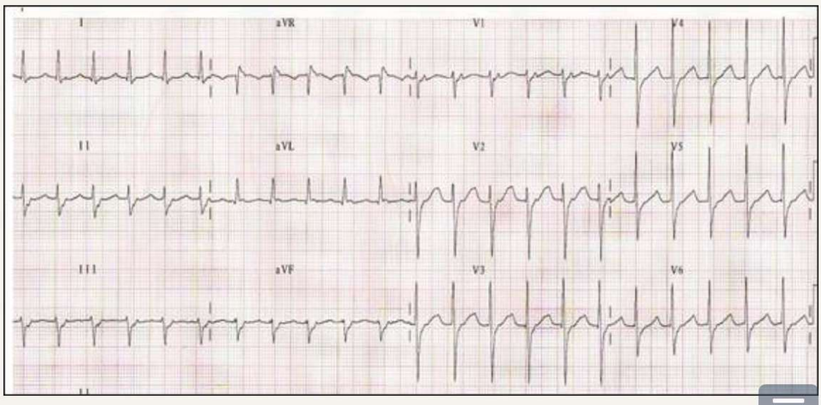
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A 28-year-old woman presents to the Emergency Department with sudden onset of palpitations whilst doing the cleaning at home. She has no past medical history of note and her only medication is the combined oral contraceptive pill. She drinks six cups of coffee per day. On examination her BP is 122/70 mmHg, with pulse 140/min and regular. Her chest is clear.

Investigations:

Hb	13.1 g/dl
WCC	6.2 $x10^9$/l
PLT	221 $x10^9$/l
Na^+	138 mmol/l
K^+	4.5 mmol/l
Creatinine	85 micromol/l

ECG is shown below.



Which of the following is the most appropriate initial intervention?

A	Adenosine
B	Amiodarone
C	Carotid sinus massage
D	Direct current (DC) cardioversion
E	Esmolol

37188

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Calculator

Normal Values

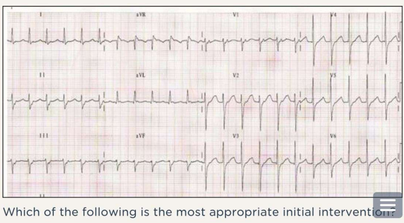
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D	Direct current (DC) cardioversion
E	Esmolol

Explanation

C	Carotid sinus massage

The ECG shows a regular narrow-complex tachycardia. There is no clear atrial activity visible, in part due to the ventricular rate. Given the patient's age and clinical background, atrioventricular re-entrant tachycardia (AVRT) or AV nodal re-entrant tachycardia (AVNRT) is the most likely diagnosis. The first-line treatment for such arrhythmias, when the patient is haemodynamically stable, is vagal stimulation. This stimulation reduces the rate of depolarisation of the AV node, a central component for both arrhythmias. If sufficient vagal stimulation is achieved, this will temporarily break the re-entrant circuit and terminate the arrhythmia. Techniques for vagal stimulation include carotid sinus massage, Valsalva manoeuvre and triggering of the diving reflex by place the patient's face in cold water (note this final technique has a more profound effect on heart rate in the paediatric population). Carotid sinus massage should be used with caution in older patients, as there is a risk of causing a stroke by breaking off plaque for an atherosclerotic carotid artery.

A	Adenosine

Adenosine has a central role in the treatment of arrhythmias involving the AV node (i.e. AVRT and AVNRT). Adenosine is an agonist for adenosine receptors (A_1) in the AV node, stimulation of these receptors leading to hyperpolarisation of the AV node. If sufficiently hyperpolarised, this breaks the re-entrant circuit and terminates the arrhythmia. Adenosine should be used as a second-line treatment after vagal manoeuvres in most patients. Caution should be used in patients with airway disease (e.g. asthma or COPD).

B	Amiodarone

Amiodarone is a type III antiarrhythmic agent and does not have a primary role in the treatment of regular narrow-complex tachy-arrhythmias. The primarily indications for amiodarone include the treatment of haemodynamically stable ventricular tachycardia, in cardiac arrest scenarios where a patient has a shockable rhythm, and potentially in patients with atrial fibrillation not controlled by initial treatments.

D	Direct current (DC) cardioversion

DC cardioversion in AVRT and AVNRT is primarily reserved for patients with haemodynamic compromise, chest pain, developing heart failure and syncope. This patient does not demonstrate any of these significant features and, as such, DC cardioversion would not be appropriate as an initial intervention.

E	Esmolol

Esmolol is a selective β_1 antagonist. β-Blockade is a primary treatment for patients with atrial fibrillation or atrial flutter. Although atrial flutter will often present as a narrow-complex regular tachycardia, it is unlikely in this case (due to patient age, ventricular rate and clinical scenario). If, when vagal manoeuvres or adenosine are used, flutter waves are revealed, then β-blockade could be considered.

37188

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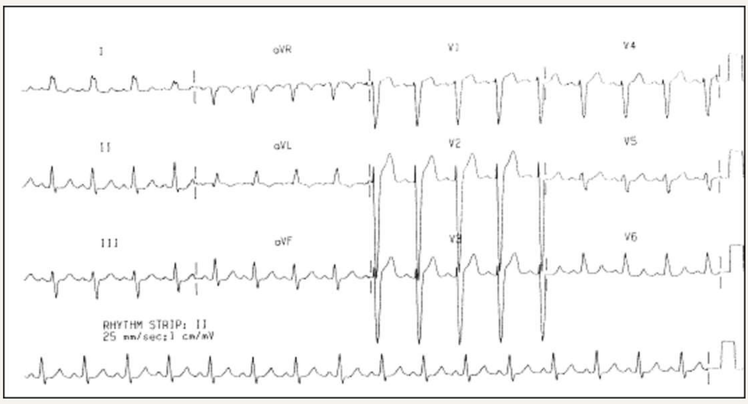
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A 62-year-old man with no previous cardiac history presents to the Emergency Department with central chest pain of 30 mins duration, which he describes as like a weight on his chest. He is also sweating profusely. He smokes 5 cigars per day, is a little overweight, and his GP has told him to cut down on fatty foods. He has also had a niggling chest pain on walking up the hill to the bus stop over the past few weeks. On examination is BP is 100/60 mmHg, pulse is 85/min and regular. He is not in cardiac failure. His ECG is shown below, one taken for an insurance medical 6 months earlier showed no QRS widening.



Investigations;

Hb	13.1 g/dl
WCC	7.8 x10^9/l
PLT	203 x109/l
Na^+	138 mmol/l
K^+	4.3 mmol/l
Creatinine	103 micromol/l

Which of the following is the most appropriate way to manage him?

A	Aspirin, Clopidogrel and Fondaparinux
B	Aspirin, Fondaparinux and await 6hr troponin
C	GTN and Bisoprolol
D	TPA
E	Urgent PCI

37189

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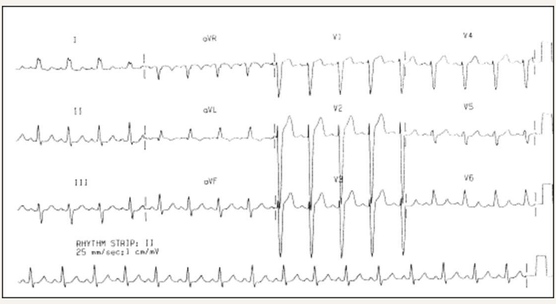
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Calculator

Normal Values

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D	TPA
E	Urgent PCI

Explanation

The ECG is consistent with new onset left bundle branch block. Given the history of severe central chest pain, an acute anterior myocardial infarction cannot be excluded. As such the most appropriate next step is urgent PCI. Managing for unstable angina with medical therapy, or waiting for the 6hr troponin risks further loss of myocardium.

Thrombolysis is proven to be inferior to angioplasty. It is therefore used only if angioplasty is unavailable or unsuitable for any reason.

37189

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A 54-year-old man presents to the Emergency Department 2 weeks after discharge following percutaneous intervention for acute MI. He received an LAD stent and was treated post-procedure with aspirin and clopidogrel in combination. On this occasion he has a history of 20 min central crushing chest pain, sweating and pre-syncope. On examination his blood pressure is 95/60 mmHg, with pulse 95/min and regular. He has bilateral crackles consistent with left ventricular failure on auscultation of the chest. ECG reveals ST elevation in leads V_1-V_5 consistent with an acute infarct.

Which of the following is the most appropriate intervention?

A	Clopidogrel, aspirin and fondaparinux
B	Diamorphine, IV nitrate and aspirin
C	Low-molecular weight (LMW) heparin, abciximab, and aspirin
D	Percutaneous intervention (PCI)
E	Thrombolysis

37192

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Calculator

Normal Values

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B	Diamorphine, IV nitrate and aspirin
C	Low-molecular weight (LMW) heparin, abciximab, and aspirin
D	Percutaneous intervention (PCI)
E	Thrombolysis

Explanation

D Percutaneous intervention (PCI)

This patient has recently had stenting for an acute MI and represents with significant cardiac chest pain associated with haemodynamic compromise. This is highly suggestive of acute in-stent thrombosis. Use of dual anti-platelet therapy has fortunately made this event rare. Better outcomes occur in patients who undergo acute PCI. PCI allows for thrombus aspiration, balloon angioplasty and placement of an additional stent as necessary.

A Clopidogrel, aspirin and fondaparinux

This bundle would be appropriate for the treatment of an acute coronary syndrome event. However, this patient is likely already on dual anti-platelet therapy given their recent stent, and the addition of fondaparinux is not the most appropriate management for stent thrombosis.

B Diamorphine, IV nitrate and aspirin

This forms part of the bundle for the acute treatment of a myocardial infarction with ongoing pain. Diamorphine and IV nitrate both lead to vasodilatation, thus lowering afterload. Additionally, diamorphine acts on opioid receptors to relieve pain. However, neither of these interventions will have a significant prognostic benefit for stent thrombosis. This patient is likely already on aspirin following their recent stent placement.

C Low-molecular weight (LMW) heparin, abciximab, and aspirin

Abciximab is a glycoprotein IIb/IIIa receptor antagonist. It is primarily recommended as an adjunct during PCI and would not be appropriate as management here. Additionally, the patient is likely already on aspirin. Furthermore, LMW heparin is likely to be insufficient therapy for the stent thrombosis this patient has presented with.

E Thrombolysis

Thrombolysis has reduced benefit in acute myocardial infarction compared with PCI. However, it should be attempted if it likely that PCI is unavailable or will be significantly delayed. In the case of stent thrombosis, thrombolysis is also thought to have less benefit than PCI: it allows for less control and does not provide the direct visualisation of the coronary anatomy available with angiography. Furthermore, given that this patient is likely already on dual anti-platelet therapy, there is an increased risk of bleeding with thrombolysis that should be considered.

37192

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You are called to a cardiac arrest on the orthopaedic ward. A 70-year-old man is five days post-left total hip replacement, and has collapsed on the toilet. When you arrive, basic life support is in progress and defibrillator pads are attached. These show pulseless VT. He undergoes 6 min of CPR with three defibrillator shocks. He is given adrenalin and a bolus of IV fluid. Spontaneous circulation returns, although his blood pressure is measured at 80/60 mmHg, pulse 110/min. He still requires ventilatory support and is intubated and ventilated prior to transfer to the ITU. His chest appears clear on auscultation.

Investigations:

Hb	11.2 g/dl
WCC	6.1 $x10^9$/l
PLT	201 $x10^9$/l
Na^+	137 mmol/l
K^+	4.3 mmol/l
Creatinine	110 micromol/l
pO_2	9.1 kPa
pCO_2	5.6 kPa
Portable chest X-ray	Endotracheal tube in position, no signs of heart failure

Which of the following is the most appropriate next step?

A	Inotropic support and observe for 12 h
B	Portable echocardiography
C	Thrombolysis
D	Transfer of coronary angiography
E	Transfer for CTPA

39041

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Normal Values

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Which of the following is the most appropriate next step?

A	Inotropic support and observe for 12 h
B	Portable echocardiography
C	Thrombolysis
D	Transfer of coronary angiography
E	Transfer for CTPA

Explanation

B Portable echocardiography

This patient has had a cardiac arrest following an orthopaedic procedure. Following return of circulation and ventilator support, this patient's pO_2 remains low. Given this clinical scenario, the most likely diagnosis is a large pulmonary embolism (PE) likely occupying the bifurcation of the pulmonary trunk (a 'saddle' PE). Direct visualisation of the PE may be possible on an echocardiogram, and if not directly visualised, right ventricular dysfunction is likely to provide significant support for this diagnosis. If the clinical suspicion for PE remains high following echocardiogram, thrombolysis would be appropriate in this patient.

A Inotropic support and observe for 12 h

Inotropic support may be necessary to maintain blood pressure. However, this does not deal with any underlying diagnosis that has caused a cardiac arrest in this postoperative patient. It may be necessary but it is not the most appropriate next step.

C Thrombolysis

This clinical scenario strongly supports the presence of a large 'saddle' PE, and thrombolysis may well be beneficial if this diagnosis is correct. However, it is important to note that the patient is only 5 days postoperative from an orthopaedic procedure. As such, his risk of bleeding is high and the diagnosis should be further investigated prior to thrombolysis being employed. If return of circulation had not been reached, then urgent thrombolysis without further investigation may have been appropriate.

D Transfer of coronary angiography

This patient is haemodynamically compromised and would be unsuitable for transfer from ITU at this time. Additionally, the underlying diagnosis points towards a large PE based on the clinical history and arterial blood gas, rather than an acute coronary event. If further investigation does not support a diagnosis of PE, then this investigation should be reconsidered once the patient is stabilised.

E Transfer for CTPA

CTPA is a first-line investigation for PE in most patient groups. However, this would require transfer to radiology and for the patient to be placed in a small CT scanner. There is a high risk of further cardiac arrest or deterioration acutely in this patient and, as such, this would not be an appropriate initial investigation at this time.

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A 23-year-old woman is admitted to the Emergency Department for the second time in a month with a syncopal episode. She admits to tiredness, which has increased over the past few months, and says that she has never been keen on physical activity, even at school, because of muscle cramps and easy fatigue. Apparently one other relative has similar symptoms. Examination reveals a BP of 100/60 mmHg, with pulse 85/min and regular. There is a postural drop of 10 mmHg on standing. Her BMI is 22.

Investigations:

Hb	13.0 g/dl
WCC	5.6 $x10^9$/l
PLT	222 $x10^9$/l
Na^+	137 mmol/l
K^+	2.9 mmol/l
Creatinine	90 micromol/l
Bicarbonate	33 mmol/l
Glucose	4.3 mmol/l

Which of the following is the most likely diagnosis?

A	Bartter syndrome
B	Classical congenital adrenal hyperplasia
C	Conn syndrome
D	Cushing syndrome
E	Gitelman syndrome

39042

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Calculator

Normal Values

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A 23-year-old woman is admitted to the Emergency Department for the second time in a month with a syncopal episode. She admits to tiredness, which has increased over the past few months, and says that she has never been keen on physical activity, even at school, because of muscle cramps and easy fatigue. Apparently one other relative has similar symptoms. Examination reveals a BP of 100/60 mmHg, with pulse 85/min and regular. There is a postural drop of 10 mmHg on standing. Her BMI is 22.

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Which of the following is the most likely diagnosis?

A	Bartter syndrome
B	Classical congenital adrenal hyperplasia
C	Conn syndrome
D	Cushing syndrome
E	Gitelman syndrome

Explanation

E Gitelman syndrome

Gitelman syndrome is a genetic disorder inherited in an autosomal-recessive manner. It presents with hypokalaemia, hypomagnesaemia and a metabolic alkalosis. The mutation causing this condition results in a loss of function of the Na-Cl symporter in the distal convoluted tubule of the kidney. This history provides clues to the genetic nature of the diagnosis by highlighting other relatives with the same symptoms.

A Bartter syndrome

This is a condition characterised by hypokalaemia, metabolic alkalosis and hypotension, as seen here. However, typically Bartter syndrome presents in childhood making the diagnosis less likely here.

B Classical congenital adrenal hyperplasia

This is an autosomal recessive genetic disorder in which the production of mineralocorticoids is impaired. This leads to hypokalaemia as well as significant dehydration from salt-wasting. Further virilisation is a key presenting feature, resulting from increased production of excessive sex steroids. These symptoms typically present in childhood.

C Conn syndrome

This is the eponymous name for primary hyperaldosteronism, in which excess aldosterone is released from the adrenal gland. This leads to hypokalaemia. Unlike this clinical scenario, Conn syndrome presents with hypertension.

D Cushing syndrome

This results from excess corticosteroids and can lead to hypokalaemia. However, typically patients develop obesity and hypertension (neither of which is present in this case).

39042

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A 32-year-old man with a history of Marfan's disease comes to the Emergency Department. He is complaining of severe central chest pain radiating to his back. He has a previous lens dislocation and takes beta-blockers to reduce the risk of aortic dissection. He smokes 10 cigarettes per day and has a family history of hypercholesterolaemia. Examination reveals a BP of 132/80 mmHg, pulse is 90/min and regular and he is in pain. His chest is clear.

Investigations:

Hb	13.1 g/dl
WCC	8.2 $x10^9$/l
PLT	193 $x10^9$/l
Na^+	137 mmol/l
K^+	4.3 mmol/l
Creatinine	100 micromol/l
CXR	Moderate mediastinal widening, in keeping with chest X-ray findings from 6 months previously
ECG	Inferior T wave inversion

Which of the following is the most appropriate next step?

A	Aspirin, fondaparinux and clopidogrel
B	CT thorax
C	Observation pending troponin result
D	Trans-thoracic echocardiography
E	Urgent PCI

39047

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You are called to see a 59-year-old man on the coronary care unit who has suffered an upper GI haemorrhage of 250 ml of fresh blood. He is recovering on the cardiology ward following PCI and stenting for inferior myocardial infarction some 3 days earlier. He is still under treatment with fondaparinux, clopidogrel and aspirin. On examination his BP is 100/70 mmHg, and there is a postural drop of 15 mmHg on moving from lying to sitting. Heart sounds are normal and his chest is clear. He has epigastric pain on palpation and admits to taking over-the-counter indigestion medications for many months before admission. PR reveals melaena.

Investigations:

Hb	7.9 g/dl
WCC	11.1 $x10^9$/l
PLT	189 $x10^9$/l
Na^+	137 mmol/l
K^+	4.3 mmol/l
Creatinine	112 micromol/l
Urea	14.2 mmol/l

You start IV fluids and arrange a blood transfusion.

Which of the following is the most appropriate next step?

A	Stop aspirin
B	Stop clopidogrel
C	Stop aspirin and clopidogrel
D	Stop fondaparinux
E	Stop aspirin, clopidogrel and fondaparinux

39049

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Calculator

Normal Values

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You are called to see a 59-year-old man on the coronary care unit who has suffered an upper GI haemorrhage of 250 ml of fresh blood. He is recovering on the cardiology ward following PCI and stenting for inferior myocardial infarction some 3 days earlier. He is still under treatment with fondaparinux, clopidogrel and aspirin. On examination his BP is 100/70 mmHg, and there is a postural drop of 15 mmHg on moving from lying to sitting. Heart sounds are normal and his chest is clear. He has epigastric pain on palpation and admits to taking over-the-counter indigestion medications for many months before admission. PR reveals melaena.

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A	Stop aspirin
B	Stop clopidogrel
C	Stop aspirin and clopidogrel
D	Stop fondaparinux
E	Stop aspirin, clopidogrel and fondaparinux

Explanation

D Stop fondaparinux

This patient has developed a significant upper gastrointestinal haemorrhage on the background of a recent angioplasty. The patient is on three medications, each of which will increase the risk of bleeding. Both clopidogrel and aspirin are important to reduce the risk of stent thrombosis and should be continued if possible. As a result, fondaparinux is the most appropriate medication to be stopped initially.

A Stop aspirin

This patient has had recent angioplasty. Dual anti-platelet therapy (DAPT) is required to reduce the risk of acute stent thrombosis. The risk of stent thrombosis is highest in the acute period and, if possible, DAPT should not be stopped in this patient.

B Stop clopidogrel

Clopidogrel or another anti-platelet agent in combination with aspirin is the standard of care for patients following the implantation of a cardiac stent. If stopped in the acute setting, the risk of stent thrombosis will increase.

C Stop aspirin and clopidogrel

As above, both these agents are required to reduce the risk of stent thrombosis. They should not be stopped unless the bleeding remains uncontrolled following further management and cessation of fondaparinux has not improved the situation.

E Stop aspirin, clopidogrel and fondaparinux

Stopping all three of these agents would significantly risk stent thrombosis in this patient. Fondaparinux is the least important of these three in the post-myocardial infarction period, and should be stopped while both aspirin and clopidogrel are continued initially.

39049

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A 56-year-old woman, with a history of right coronary artery stent placement three years earlier for an inferior myocardial infarction, presents to the Emergency Department with palpitations lasting for an hour, and syncope related to the fast heart rate. She had one previous episode of palpitations the previous month, which reverted spontaneously after 30 min. Medication includes bisoprolol 2.5 mg OD, ramipril 10 mg OD, atorvastatin 20 mg ON and aspirin 75 mg OD. On examination her blood pressure is 80/60 mmHg, pulse 140/min and irregular and there are bilateral basal crackles on auscultation of the chest.

Investigations:

Hb	129 g/l
WCC	7.4×10^9/l
PLT	208×10^9/l
Na^+	137 mmol/l
K^+	4.5 mmol/l
Creatinine	105 micromol/l
Glucose	5.4 mmol/l
ECG	Atrial fibrillation with evidence of lateral ischaemia

Which of the following is the most appropriate intervention?

A	Amiodarone
B	DC cardioversion
C	Digoxin
D	Esmolol
E	Flecainide

39052

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Calculator

Normal Values

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Which of the following is the most appropriate intervention?

A	Amiodarone
B	DC cardioversion
C	Digoxin
D	Esmolol
E	Flecainide

Explanation

B	DC cardioversion

The clinical history and examination findings reveal a patient in atrial fibrillation (AF) with clear signs suggestive of haemodynamic compromise secondary to the arrhythmia. Of note, the patient has a significant hypotension, clinical features of heart failure on examination, syncope and signs of cardiac ischaemia on the ECG. Any one of these four features would necessitate the use of urgent DC cardioversion to correct the arrhythmia. This will usually require sedation or general anaesthesia and airway management. The on-call anaesthetist is likely to be the first port of call when getting help in this situation.

A	Amiodarone

Amiodarone is a class III antiarrhythmic and is primarily indicated in refractory AF or broad-complex tachy-arrhythmias without haemodynamic compromise. In this case, Amiodarone is not the best treatment option. The patient has haemodynamic compromise with a narrow complex tachycardia and requires urgent DC cardioversion.

C	Digoxin

Digoxin acts by reducing conduction through the AV node and will be unlikely to lead to cardioversion. Additionally, the onset of action for digoxin is significantly longer than a number of the other options listed here, which makes it less appropriate in this emergent clinical situation.

D	Esmolol

Beta-blockade has a central role in the management of irregular narrow-complex tachy-arrhythmias (e.g. AF) when they are not leading to haemodynamic compromise. If this patient were stable, this would likely be the correct management option. However, given the clinical instability, urgent rhythm correction is indicated with DC cardioversion.

E	Flecainide

Flecainide is a class I antiarrhythmic which is often successful in leading to pharmacological cardioversion in AF. However, this patient has a history of ischaemic heart disease, which is a contra-indication to the use of class I anti-arrhythics due to the increased risk of pro-arrhythmic effects.

39052

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A 58-year-old man with a history of type 2 diabetes mellitus and hypertension comes to the Emergency Department complaining of central crushing chest pain radiating to his left arm. He takes a number of medications including ramipril, simvastatin, aspirin, metformin and gliclazide. Examination reveals a blood pressure of 155/90 mmHg and a regular pulse (88/min). There are bilateral crackles on auscultation of the chest consistent with heart failure.

Investigations:

Hb	13.1 g/dl
WCC	8.9 $x10^9$/l
PLT	210 $x10^9$/l
Na^+	137 mmol/l
K^+	4.5 mmol/l
Creatinine	132 micromol/l
HbA1c	56 mmol/mol (7.3%)
ECG	anterolateral ST depression
CXR	Cardiomegaly, evidence of LVF

His pain eases from 8/10 to 3/10 with two doses of sublingual GTN and one dose of IV morphine. He is given fondaparinux, aspirin and clopidogrel.

Which of the following is the most appropriate immediate intervention?

A	IV beta-blockade
B	IV GTN
C	IV Morphine
D	Proceed to percutaneous intervention (PCI)
E	Thrombolysis

39054

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Which of the following is the most appropriate immediate intervention?

A	IV beta-blockade
B	IV GTN
C	IV Morphine
D	Proceed to percutaneous intervention (PCI)
E	Thrombolysis

Explanation

B IV GTN

This patient has presented with features highly suggestive of a non-ST-elevation myocardial infarction. He remains hypertensive and has ongoing pain despite the use of sublingual GTN. Ongoing pain is suggestive of continuing myocardial ischaemia/infarction. Although PCI is likely to be required, this will take time to organise. GTN acts as a vasodilator through the production of NO. Vasodilatation reduces cardiac afterload, which has the effect of improving heart failure symptoms and reducing the cardiac oxygen demand.

A IV beta-blockade

β-Blockade will have negative chronotropic and inotropic effects, reducing cardiac oxygen demand. However, this patient has signs of acute heart failure (bilateral crackles of respiratory auscultation). The use of β -blockade in acute heart failure can lead to further decompensation and should not be initiated in this setting.

C IV Morphine

IV morphine would have a dual effect if given to a patient in this setting. Morphine acts as a vasodilator and will reduce cardiac afterload. Furthermore, it will act as an analgesic to reduce the ongoing chest pain. The reduction in afterload is the key to immediate intervention in this case; the effect of IV morphine as a vasodilator is less significant than with IV GTN. Furthermore, IV GTN has a short half-life allowing for more effective titration.

D Proceed to percutaneous intervention (PCI)

PCI is likely to be the most appropriate definitive intervention. However, this patient is currently unstable. IV GTN is a quick intervention that may reduce heart failure features and ongoing myocardial ischaemia.

E Thrombolysis

Thrombolysis may be considered in an ST-elevation myocardial infarction in a setting where PCI is not available or will be significantly delayed. Although the patient has ongoing chest pain at present, there is no sign of ST elevation. If there was ongoing chest pain despite maximal IV GTN and PCI was not available, then thrombolysis could be considered.

39054

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A 65-year-old man who has had two previous myocardial infarctions and now has chronic heart failure comes to the cardiology clinic with worsening shortness of breath and a fall in his exercise tolerance. Current medication includes ramipril 10 mg OD, furosemide 80 mg OD, bisoprolol 10 mg OD and spironolactone 25 mg OD. Examination reveals a BP of 125/82 mmHg, with pulse 85/min and regular. Auscultation of the chest reveals bi-basal crackles and he has mild pitting oedema affecting both ankles.

Investigations:

Hb	12.9 g/dl
WCC	6.4 $x10^9$/l
PLT	189 $x10^9$/l
Na^+	137 mmol/l
K^+	5.0 mmol/l
Creatinine	115 micromol/l
Glucose	5.1 mmol/l
CXR	Cardiomegaly
Echocardiogram	Left ventricular ejection fraction 32%
ECG	Sinus rhythm with poor R-wave progression

Which of the following is the most appropriate next step to improve mortality?

A	Cardiac resynchronisation therapy (CRT)
B	Increase furosemide
C	Increase spironolactone
D	Start digoxin
E	Start ivabradine

40125

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A 65-year-old man who has had two previous myocardial infarctions and now has chronic heart failure comes to the cardiology clinic with worsening shortness of breath and a fall in his exercise tolerance. Current medication includes ramipril 10 mg OD, furosemide 80 mg OD, bisoprolol 10 mg OD and spironolactone 25 mg OD. Examination reveals a BP of 125/82 mmHg, with pulse 85/min and regular. Auscultation of the chest reveals bi-basal crackles and he has mild pitting oedema affecting both ankles.

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B	Increase furosemide
C	Increase spironolactone
D	Start digoxin
E	Start ivabradine

Explanation

E	Start ivabradine

This case is one of a patient with significant heart failure on a wide range of medications appropriate for their clinical case. Despite this, they have continued to deteriorate. Ivabradine acts as an inhibitor of the I_f current within the myocardium. This current, particularly present in the sino-atrial and atrio-ventricular nodes, acts as the cardiac pacemaker. By inhibiting this current, ivabradine reduces the heart rate without impacting the force of cardiac contraction. This has been shown to reduce heart failure hospitalisation and mortality in patients already on maximum medical therapy. Due to its mechanism, ivabradine is only effective in patients in sinus rhythm.

A	Cardiac resynchronisation therapy (CRT)

CRT is a type of cardiac device designed to stimulate the septal and lateral walls of the left ventricle to contract at the same time. This improves cardiac output and results in improved heart failure symptoms in some patients. This is only a benefit when the contraction of the patinet's left ventricle is dys-synchronous prior to device implantation. Ventricular dys-synchrony is suggested by an ECG showing a broad QRS complex (especially LBBB). Because this is not demonstrated here, implantation of such a device is not indicated.

B	Increase furosemide

Despite significant heart failure in this patient, clinical examination reveals that he is not significantly fluid overloaded. Furosemide improves heart failure symptom burden but does not improve survival in heart failure. Given a lack of significant fluid overload, up-titration of furosemide is unlikely to improve the clinical situation significantly.

C	Increase spironolactone

Use of K^+-sparing diuretics (e.g. spironolactone) in heart failure has been shown to improve mortality in those already on maximal tolerated doses of both an ACE inhibitor and β-blocker. Spironolactone at 25 mg OD is the standard dose for this medication in heart failure. There is no significant evidence to suggest that an increase in dose improves outcomes in heart failure patients. In this particular patient, the K^+ concentration is already on the upper limit of normal and increasing this diuretic may further increase this level.

D	Start digoxin

Digoxin decreases heart rate and increases force of contraction through blockade of the Na^+/K^+ ATPase. Digoxin has been shown to reduce hospital admissions for patients with heart failure but does not improve mortality. In clinical practice it is primarily used in patients with heart failure and atrial fibrillation (not present in this case).

40125

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A 78-year-old man presents to the cardiology clinic for review. For the past 2 years he has suffered dull, aching chest pains and reduced exercise tolerance, having to cut the length of his dog walk from 3 to 2 miles, missing out a steep hill at the end. There is no chest pain at rest. When he gets pain on exercise it settles when he rests for 3-4 minutes. He is an ex- smoker, having given up 20 years ago, and has a history of hypertension for which he takes ramipril and indapamide. His GP has also prescribed aspirin 75 mg OD and atorvastatin 10 mg ON. Apparently he tried a GTN spray but this gave him a headache. Examination reveals a blood pressure of 142/85 mmHg, with pulse 80/min and regular. His chest is clear and there is no peripheral oedema. He has a BMI of 24kg/m^2.

Investigations:

Hb	13.1 g/dl
WCC	8.0 x10^9/l
PLT	178 x10^9/l
Na^+	137 mmol/l
K^+	5.0 mmol/l
Creatinine	112 micromol/l
Total cholesterol	4.1 mmol/l
CXR	Unremarkable

Which of the following is the most appropriate intervention to manage his chest pain?

A	Bisoprolol
B	Diltiazem
C	Isosorbide mononitrate – sustained release
D	Ivabradine
E	Nicorandil

40248

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E	Nicorandil

Explanation

A Bisoprolol

This patient presents with features strongly suggestive of angina. NICE guidance on chest pain of recent onset suggests that such patients (with typical angina symptoms) should undergo CT coronary angiography. However, in the meantime treatment should be initiated. NICE guidance for stable angina supports the use of β-blockade for symptomatic and prognostic benefit.

B Diltiazem

Calcium channel blockers are second-line agents in the treatment of stable angina and should be considered in patients intolerant to β-blockade.

C Isosorbide mononitrate – sustained release

sosorbide mononitrate is a long-acting nitrate and is a treatment option considered if both β-blockers and calcium channel blockers are contraindicated or not tolerated. This option could also be considered as a third agent if symptoms are not controlled using both β-blockade and a calcium channel blocker combined.

D Ivabradine

Ivabradine acts by blocking the I_f current primarily located in the sino-atrial node. This leads to a reduced heart rate and lowers myocardial oxygen demand. Much like long-acting nitrates, ivabradine can be considered if both β-blockers and calcium channel blockers are contra-indicated, not tolerated or insufficient to manage the patient symptoms. Of note, ivabradine is only effective in patients in sinus rhythm and should not be initiated in patients in atrial fibrillation.

E Nicorandil

Nicorandil acts as a vasodilator and can be considered for the treatment of angina. It has the same indications as long-acting nitrates and should be considered if β-blockade and/or calcium channel blockade is contraindicated, not tolerated or ineffective.

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External Links

NICE. G95 Chest pain of recent onset: assessment and diagnosis. 2016
nice.org.uk/guidance/cg95

NICE. CG126 Stable angina: management. 2016.
nice.org.uk/guidance/cg126/

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A 76-year-old man with a history of hypertension and type 2 diabetes mellitus is reviewed in the cardiology clinic. His GP has referred him having noted an irregular pulse at a routine check-up. Current medication includes ramipril, indapamide, atorvastatin and aspirin. On examination his blood pressure is 132/88 mmHg, with pulse 82/min, irregular. His chest is clear and there is no ankle swelling. His abdomen is soft and non-tender and he has a BMI of 28kg/m^2.

Investigations:

Hb	12.8 g/dl
WCC	5.6 x10^9/l
PLT	203 x10^9/l
Na^+	137 mmol/l
K^+	4.3 mmol/l
Creatinine	123 micromol/l
Glucose	5.9 mmol/l
Echocardiogram	Increased left atrial size, left ventricular ejection fraction 37%
ECG	AF with changes consistent with an old inferior infarct

Which of the following is the most appropriate intervention with respect to stroke prophylaxis?

A	Add clopidogrel to aspirin
B	Add dipyridamole to aspirin
C	Continue aspirin
D	Switch aspirin to clopidogrel
E	Switch aspirin to apixaban

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Explanation

E Switch aspirin to apixaban

This patient has non-valvular atrial fibrillation. His CHA_2DS_2-VASc score is 5 (age >75 years, heart failure, diabetes mellitus and hypertension). This patient requires anticoagulation for stroke prophylaxis. Both NICE and European Society of Cardiology guidelines suggest that direct-action oral anticoagulants should be initiated. Apixaban is a factor-X inhibitor (others include rivaroxaban and edoxaban).

A Add clopidogrel to aspirin

This patient has atrial fibrillation and requires anticoagulation rather than antiplatelet therapy. Both clopidogrel and aspirin are antiplatelet agents and, as such, neither is appropriate as management for this patient.

B Add dipyridamole to aspirin

Both of these medications are anti-platelet agents and, as such, are not appropriate for this patient. Atrial fibrillation requires anticoagulation as stroke prophylaxis.

C Continue aspirin

Aspirin was previously considered appropriate treatment for patients with atrial fibrillation thought to have a low-moderate risk of stroke. However, this is no longer considered appropriate as the bleeding risk with aspirin outweighs any reduction in stroke risk.

D Switch aspirin to clopidogrel

Switching between antiplatelet agents will have no significant benefit in this patient. The increased risk of stroke in atrial fibrillation should be managed through anticoagulation. As such, the use of antiplatelet agents is not sufficient or appropriate.

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External Links

NICE. CG180 Atrial fibrillation: management
nice.org.uk/guidance/cg180

European Society of Cardiology. Atrial Fibrillation 2016 (management of).
escardio.org/Guidelines/Clinical-Practice-Guidelines/Atrial-Fibrillation-Management

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An 18-year-old woman presents to the Emergency Department for review. She has been unwell for the past few days with fevers, lethargy and joint pains, and has an erythematous rash over her trunk. Past history of note includes a severe episode of tonsillitis/pharyngitis which began a short period before these new symptoms. On examination she has a BP of 115/82 mmHg, with pulse 85/min and regular. There is a mitral murmur but otherwise auscultation of the chest is normal. You note joint pains predominantly affecting her knees and elbows, subcutaneous nodules over each elbow and an erythematous rash over the trunk.

Investigations:

Hb	13.0 g/dl
WCC	10.4 $x10^9$/l
PLT	181 $x10^9$/l
Na^+	137 mmol/l
K^+	4.3 mmol/l
Creatinine	101 micromol/l
ESR	75 mm/1st hour
CRP	132 mg/l
Urine	Blood+, protein+
Throat swab	Streptococcus Group A

Which of the following is the most important intervention?

A	Antibiotic therapy
B	Aspirin
C	Ibuprofen
D	Prednisolone
E	Bed rest

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Which of the following is the most important intervention?

A	Antibiotic therapy
B	Aspirin
C	Ibuprofen
D	Prednisolone
E	Bed rest

Explanation

A	Antibiotic therapy

This patient presents with a likely diagnosis of rheumatic fever. The major and minor manifestations of this condition are presented in the table below. Rheumatic fever is an inflammatory disease that develops following a streptococcal throat infection. Streptococcal throat infections should be treated with antibiotics, in part to avoid the risk of rheumatic fever and the late manifestation of rheumatic heart disease.

Major criteria	Minor criteria
Migrating polyarthritis	Fever
Myocarditis/pericarditis ± valvular disorder	Arthralgia
Subcutaneous nodules	Raised ESR or CRP
Erythema marginatum	Leukocytosis
Sydenham's chorea	ECG showing heart block
	Previous rheumatic fever

B	Aspirin

Aspirin is considered to be an effective agent for the treatment of inflammation in the case of rheumatic fever. There is limited evidence to support the use of aspirin or corticosteroids over one another. However, although useful for treating inflammation, antibiotics are the key treatment in this condition.

C	Ibuprofen

NSAIDS can form a part of the treatment bundle for rheumatic fever, but aspirin would be preferred over ibuprofen. The management of the inflammatory elements for rheumatic fever are secondary to effective antibiotic therapy.

D	Prednisolone

Steroids and NSAIDs have limited evidence to suggest one over the other in the treatment of the inflammatory component of rheumatic fever, and either can be considered. Steroids are preferred in cases with cardiac involvement. Although an important element of the treatment of this patient, it is secondary to the use of antibiotics.

E	Bed rest

Rheumatic fever must be treated to reduce the incidence of long-term sequelae. Bed rest is not an appropriate treatment option.

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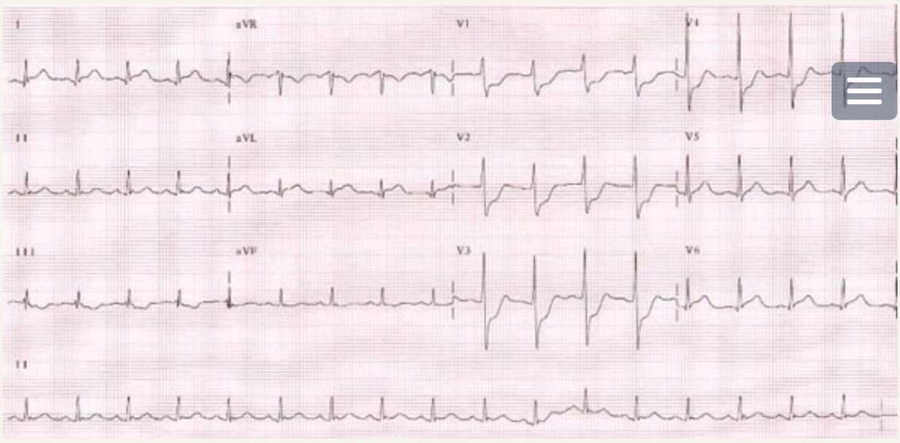
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A 45-year-old male presents with history of left precordial pain that started 2 hours ago when he was watching television after dinner. The pain is moderate in intensity, radiates to ulnar aspects of both arms and is associated with nausea and one episode of vomiting. He is an accountant and has a 20 pack-year history of smoking. He consumes 3–4 glasses of wine each week and generally has a sedentary lifestyle. Physical examination reveals a pulse rate of 77/min, blood pressure 150/90 mmHg and respiratory rate of 14/min. There is no jugular venous distension, heart sounds are normal and lungs are clear to auscultation. A chest X-ray is normal.

A 12-lead electrocardiogram (ECG) is obtained and is shown below.



What is the coronary artery that supplies most of the affected territory?

A	Left main coronary artery
B	Left circumflex artery
C	Left anterior descending artery
D	Right coronary artery
E	Ramus/intermediate artery

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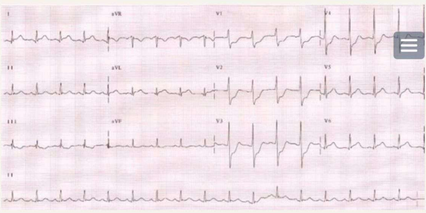
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Explanation

D Right coronary artery

This patient has presented with typical features suggestive of an acute coronary syndrome. The ECG shows ST-depression in the anterior chest leads (V_1-V_4), upright T-waves and prominent R-waves. These features highlight a posterior myocardial infarction. The posterior aspect of the myocardium is normally supplied by the right coronary artery (right coronary artery supply of the posterior aspect is present in 70% of patients). If the ECG of this patient was repeated with the leads V_1-V_6 repositioned on the posterior aspect of the chest (labelled as V_7-V_{12}), then a ST-elevation picture is seen (as shown in the figure below).

A Left main coronary artery

The left coronary artery supplies the septal, anterior and lateral aspects of the left ventricle. In most cases it bifurcates into the left anterior descending artery and the left circumflex artery. Obstruction of this artery would present typically with widespread changes across the ECG.

B Left circumflex artery

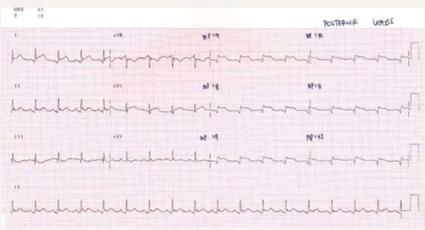
The left circumflex artery supplies the lateral aspect of the left ventricle. This is represented in the ECG by leads I, V_5 and V_6. There are no lateral changes seen in the above ECG.

C Left anterior descending artery

The left anterior descending artery supplies the anterior aspect of the left ventricle and the anterior 2/3 of the interventricular septum. This is represented on the ECG as leads V_1-V_4. The above ECG could be confused as an NSTEMI in the anterior septal region. However, the prominent R-waves and upright T-waves should point you towards a posterior MI.

E Ramus/intermediate artery

The intermediate artery is an additional artery that can form as a trifurcation where the left main stem splits into the left anterior descending artery and the left circumflex artery. It is present in around 20% of the population and can supply variable extents of the anterior and lateral aspects of the left ventricle.



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A 71-year-old man returns to the ward for rehabilitation after discharge from the ITU where he was treated for 6 days following a cardiac arrest in the community, thought to be related to right lower lobe pneumonia. Although he appears alert and can converse with nursing staff, they have noticed some lack of short-term memory and intention myoclonus when he attempts to carry out basic tasks on the ward. On examination his blood pressure is 132/82 mmHg, with pulse 75/min and regular. Heart sounds are normal; however, there is still evidence of decreased breath sounds at the right base. He is orientated in time, place and person, and can converse about recent events he has seen on the news. Although power appears normal bilaterally, you confirm intention myoclonus.

Which of the following is the most likely diagnosis?

A	Lance-Adams syndrome
B	Myoclonic status epilepticus
C	Pontine stroke
D	Post-ITU delirium
E	Propofol withdrawal syndrome

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A 71-year-old man returns to the ward for rehabilitation after discharge from the ITU where he was treated for 6 days following a cardiac arrest in the community, thought to be related to right lower lobe pneumonia. Although he appears alert and can converse with nursing staff, they have noticed some lack of short-term memory and intention myoclonus when he attempts to carry out basic tasks on the ward. On examination his blood pressure is 132/82 mmHg, with pulse 75/min and regular. Heart sounds are normal; however, there is still evidence of decreased breath sounds at the right base. He is orientated in time, place and person, and can converse about recent events he has seen on the news. Although power appears normal bilaterally, you confirm intention myoclonus.

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C	Pontine stroke
D	Post-ITU delirium
E	Propofol withdrawal syndrome

Explanation

A Lance-Adams syndrome

Lance-Adams syndrome is a rare condition that can occur following a period of cerebral hypoxia. Onset occurs within days to weeks of cardiac arrest. It is characterised by intention myoclonus, as seen with this patient. Although no trials on effective treatment have been conducted, levetiracetam, clonazepam and valproate have been recommended as first-line treatments.

B Myoclonic status epilepticus

Similar to Lance-Adams syndrome, this is a complication of cerebral hypoxia. Unlike the case presented here, however, onset is within 48 h of the hypoxic insult. It has a poor prognosis and is difficult to control. Furthermore, it leads to generalised multifocal clonus and significant cognitive impairment.

C Pontine stroke

Pontine stroke results from pontine infarction following interruption of the vertebra-basilar circulation. The exact clinical presentation depends on the specific area of the pons affected. Typical features include decreased consciousness, nausea and vomiting.

D Post-ITU delirium

This condition is common in patients who are admitted to the ITU due to a number of risk factors including sedating medications, immobilisation and critical illness. This patient remains oriented to time, place and person. Despite some short-term memory deficit reported, the patient does not appear to have significant cognitive impairment. As such, this points away from the diagnosis of delirium.

E Propofol withdrawal syndrome

This condition is recognised as occurring in some individuals following exposure to propofol. However, it typically presents with generalised seizure activity, which is not reported here.

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A 71-year-old woman comes to the hypertension clinic for review. Her GP is struggling to manage her hypertension, which is still poorly controlled despite treatment with ramipril 10 mg OD and amlodipine 5 mg OD. She suffered an anterior MI 5 years previously and continues to smoke 5 cigarettes per day. On examination her blood pressure is 155/95 mmHg, with pulse 65/min and regular. There are bibasal crackles on auscultation, there is no ankle swelling. Abdomen is soft and non-tender with no palpable masses. Her BMI is 31kg/m^2.

Investigations:

Hb	130 g/l
WCC	7.1 x 10^9/l
PLT	203 x 10^9/l
Na^+	140 mmol/l
K^+	4.9 mmol/l
Creatinine	112 micromol/l
Glucose	6.5 mmol/l

Which of the following is the most appropriate next step?

A	Add atenolol
B	Add bendroflumethiazide
C	Add doxazosin
D	Add indapamide
E	Increase amlodipine to 10 mg OD

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E	Increase amlodipine to 10 mg OD

Explanation

D Add indapamide

This patient presents with significant ongoing hypertension. Along with other risk factors reported in the clinical vignette, she has a significant risk of vascular complications from her hypertension, which should be controlled aggressively. She is already on an ACE inhibitor and calcium channel blocker. The next step recommended in the NICE guideline (see below) would be to add a thiazide-like diuretic (such as indapamide).

A Add atenolol

Atenolol is a non-selective β-blocker. β-Blockade is not recommended for routine treatment of hypertension, due to the limited benefit compared with other agents. Additionally, in this patient with a raised BMI, β-blockade is known to impair glucose tolerance.

B Add bendroflumethiazide

Bendroflumethiazide is a thiazide diuretic. Although commonly used for the treatment of hypertension, it is no longer recommended in current NICE guidance.

C Add doxazosin

Doxazosin is an α-blocker - these agents are not recommended for the routine treatment of hypertension. In the case of this patient, her previous MI increases the risk of heart failure, which would be worsened by the use of an α-blocker.

E Increase amlodipine to 10 mg OD

Up-titration of amlodipine to 10 mg OD is likely to result in only a modest reduction in systolic blood pressure (by ≤5 mmHg). As such, the patient will still require a further agent. Additionally, increasing the dose of amlodipine may increase the risk of adverse effects occurring (including ankle swelling).

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External Links

NICE. CG127 Hypertension in adults: diagnosis and management. 2011.
nice.org.uk/guidance/cg127

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A 56-year-old man is reviewed on the cardiology ward. He is currently prescribed vancomycin 500 mg BD for bacterial endocarditis, and his trough vancomycin levels are available for your review. He is responding to therapy, blood pressure is 122/72 mmHg, with pulse 70/min and regular. He has a murmur consistent with mitral regurgitation, and has not spiked a fever over the past 24 h. His eGFR is 50 ml/min and the trough vancomycin level is measured at 35 mg/l.

Which of the following is the correct course of action?

A	Increase dose to 750 mg BD
B	Increase dose to 1 g BD
C	Omit dose and restart when level <15 mg/l
D	Omit single dose and continue at 500 mg BD in 12 h
E	Reduce dose to 250 mg OD

70597

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Normal Values

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B	Increase dose to 1 g BD
C	Omit dose and restart when level <15 mg/l
D	Omit single dose and continue at 500 mg BD in 12 h
E	Reduce dose to 250 mg OD

Explanation

C	Omit dose and restart when level <15 mg/l

Vancomycin is an antibiotic used systemically to treat methicillin-resistant *Staphylococcus aureus* infections. IV administration is necessary for systemic treatment as vancomycin is not absorbed from the intestine. The trough level listed above is significantly higher than the toxic threshold (30 mg/l). As such, dose omission is required to reduce the risk of significant complications (including ototoxicity and nephrotoxicity). The BNF recommends trough levels of 15-20 mg/l for endocarditis. Specific protocols for the dosing of vancomycin differ between NHS trusts, but all should suggest omission if the trough level is as high as documented here. Re-initiation once in range should be in consultation with the microbiology team.

A	Increase dose to 750 mg BD

The trough level described in this vignette is much higher than the therapeutic range. Increasing the dose in this situation will only make the situation worse.

B	Increase dose to 1 g BD

This will further increase the circulating levels of vancomycin, increasing the risk of significant adverse effects.

D	Omit single dose and continue at 500 mg BD in 12 h

The half-life of vancomycin is highly variable and dependent on renal function. It is possible that the concentration of vancomycin may have reached a normal level after 12 h; however, further trough levels should be taken to confirm this before re-initiating.

E	Reduce dose to 250 mg OD

Although it is likely that over time this would correct the high vancomycin concentration described here, administration of further vancomycin to this patient is incorrect. At least one dose should be omitted and vancomycin only re-initiated when levels are within the normal range.

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A 54-year-old publican is admitted with shortness of breath and increasing peripheral oedema. He has extremely limited exercise tolerance and is barely able to move around the pub. On examination he has signs of chronic liver disease and biventricular cardiac failure. His blood pressure is 110/70 mmHg, with a pulse of 85/min. You diagnose cardiomyopathy. He admits that he is unable to reduce his consumption of alcohol.

Which of the following will have the biggest impact on his prognosis?

A	Alcohol cessation
B	Bisoprolol
C	Furosemide
D	Ramipril
E	Valsartan / sacubitril

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A	Alcohol cessation
B	Bisoprolol
C	Furosemide
D	Ramipril
E	Valsartan / sacubitril

Explanation

A	Alcohol cessation

This patient has alcoholic cardiomyopathy, where the patient can gain rapid improvement in their symptoms as long as they give up alcohol. This improves ejection fraction, exercise tolerance and ultimately mortality. Unfortunately, with continued symptoms of heart failure, annual mortality approaches 20%.

B	Bisoprolol

Heart failure associated with alcohol abuse is often low-output/hypotensive heart failure, meaning that there is a more limited role for beta blockade.

C	Furosemide

Fluid offloading with loop diuretics is important in the management of alcoholic cardiomyopathy, although giving up alcohol is more important with respect to outcome.

D	Ramipril

ACE inhibitors do have a positive impact on outcomes in alcoholic cardiomyopathy, although lower blood pressure and decreased renal perfusion associated with continued alcohol abuse may limit their effectiveness.

E	Valsartan / sacubitril

Valsartan/sacubitril does improve cardiac output and mortality in patients with dilated cardiomyopathy and is an important addition to alcohol cessation in improving outcomes, but is the second step in managing the condition after giving up alcohol.

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A 42-year-old adopted man presents with symptoms of angina and intermittent claudication. On examination he is obese and has evidence of tendon xanthomas. Lipid profiling reveals a low-density lipoprotein cholesterol level of 8.2 mmol/l, with normal triglyceride levels.

Which of the following is the first step in his lipid management?

A	Fenofibrate
B	Atorvastatin
C	Ezetimibe
D	Evolocumab
E	Nicotinic acid

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B	Atorvastatin
C	Ezetimibe
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E	Nicotinic acid

Explanation

B	Atorvastatin

This patient has markedly raised low-density lipoprotein cholesterol (LDL-c) levels and almost certainly has heterozygous familial hypercholesterolaemia (FH). Prognosis in these patients depends on reducing LDL-c to as near normal levels as possible, and treating other risk factors such as smoking and hypertension as aggressively as possible. The dose of atorvastatin should be titrated to the maximum tolerated or 80 mg/day, whichever is greater.

A	Fenofibrate

Fibrates are the intervention of choice for familial hypertriglyceridaemia, rather than hypercholesterolaemia.

C	Ezetimibe

Ezetimibe can further reduce LDL cholesterol on top of statins alone and is therefore the default oral add-in therapy for patients not at target cholesterol.

D	Evolocumab

Evolocumab is a PCSK9 inhibitor that can significantly reduce LDL cholesterol and achieve target levels in patients unable to attain them on statins alone. It is given as a 2-weekly or monthly injectable therapy, and is usually second or third line in the management of FH.

E	Nicotinic acid

Nicotinic acid is most useful in reducing elevated triglycerides, not LDL cholesterol.

70807

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